THE IRON TRADE REVIEW

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THE IRON TRADE REVIEW.

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CLEVELAND, O., AUGUST 6, 1891.

THE WEEK IN IRON CIRCLES.

General Features. "Despite the stagnation which continues to exist at certain points, the general business situation of the country, as a whole, shows unmistakable signs of slow but steady improvement." So says the *American Banker*, a safe and conservative authority. In confirmation of its views it notes the fact that money has at last begun to move West, and winter wheat East, and in consequence general trade has become more active at the large centres in the Central West, such as Chicago, St. Louis, Kansas City, Minneapolis and St. Paul, where staple dry goods, boots and shoes and hardware, stimulated by excellent crop prospects, are moving with more freedom. In the meantime the pig iron market continues sluggish, with some indications of a break among Southern furnacemen. At Louisville, for instance, during the first part of the week, there were signs of weakness, grey forge being offered for five months' delivery on basis of $9.75 Birmingham; but towards the close prices were better, and grey forge was held firmly on basis of $10 to $10.25 by one or two of the leading furnaces, and some sales for favorite brands have been effected on this basis. Offerings on the part of some furnaces anxious to sell, however, continue at less than basis of $10, with buyers for large amounts afraid to take hold, owing to fear of tight money. Towards the close of the week there were heavy sales made by manufacturers, one reported by a leading consumer that will require the purchase of about 14,000 tons. At Cincinnati there has been the usual active competition for the limited number of orders placed during the week, but only one or two transactions at very low price are reported, and these are not well authenticated. There is little change in the condition among Southern coke furnaces. The higher grades of foundry, soft and silvery irons are scarce and the lower grades abundant. The Woodstock coke furnace made a successful start and promises to be one of the large producers. Most of the Southern charcoal furnaces are accumulating iron on their yards, hoping that the long looked-for revival in car building will soon materialize and relieve them. Orders for pig metal at Chicago for the most part are of small size and covering early deliveries. They are still some large buyers who are waiting for special prices and are prepared to quickly pick up any bargains of this kind which may be offered. Two or three sales of round lots of Southern coke iron have been reported, ranging in size from 1,000 to 2,000 tons. With this exception orders placed have been mainly for small amounts. Prices remain practically unchanged on Lake Superior charcoals. One or two of the leading companies are now holding their product at $18.50, Chicago, in consequence of the heavy sales which they have made, taking nearly their product for the coming season. Other furnaces making the same class of metal are still in the market for business at from $17.50 to $18. The St. Louis iron market continues to improve. Our correspondents note quite a difference in number of inquiries and the increased sales. However, most of the orders are for small lots. The car works are all running full and report some improvement in trade. We understand that an order for 500 cars was placed with one of the works in the St. Louis district a few days ago. The extreme quiet that has pervaded the Detroit market in all branches, except Lake Superior charcoal, continues and now includes the exception noted. It is generally believed that a livelier demand will be very soon seen, but in the meantime the furnaces are accumulating stocks which threaten to hold the market down at its present low ebb, probably all of the present year at least. Buffalo reports that it is not so difficult to find buyers, but only small quantities are being purchased. A better feeling is apparent among consumers, which must be due to the improved business outlook. During the past thirty to sixty days there has been a marked increase in production, and the question is a pertinent one, whether consumption is keeping pace with this increase. From the recent figures of the American Iron and Steel Association it appears that the decline in pig iron production during the past six months has been due chiefly to the falling off in demade for steel rails, the consumption of mild Bessemer steel showing no material falling off. It would appear, therefore, that the general consumption of the country has not been as seriously affected as the figures at first sight would seem to show. Connellsville coke continues to be produced somewhat in excess of requirements, but nearly 500 ovens were blown out last week to meet this condition of things. Concerning the English pig iron market our correspondents, S. W. Royse & Company, of Manchester, write, under date of July 25th: The course of business in the metal markets during June has been very disappointing. There has only been a small trade at Glasgow, notwithstanding which, however, prices have receded but little. Prices of Middlesbrough pig iron have declined about 1s. 3d. per ton during the month, and merchants there are now very desirous of selling, but buyers are difficult to find at present.

The Local Situation. The combination of low ore prices with high lake freights is fraught with disastrous results for the ore trade. It was not prepared for this very large advance of the price of ore carried at this season of the year. The vessels which started in with a 60 or 65-cent rate from Escanaba now re-receive $1.10, and while the ore producers naturally figure on a rate of freights to be paid all through the year higher than that which started the season, they were not prepared for an advance as heavy or as early. Coming at this time, when so nearly the entire estimated output had been sold up—in the sense at least that to bring down more than the sales would be a physical impossibility this year—the producers are in no position to recuperate by advancing the prices of ore yet to be sold, and in consequence will be material losers in the year's business. The high rate paid for ore carriers is induced by the offers made by grain forwarders and must result in hardship to the coal trade as well, since a good many boats will now prefer to go up light for the big ore rate rather than wait for coal cargoes to take up. The vessel men are not alone in this bullish feeling, since the railways, unmindful of the lesson of the recent past, are talking of advance in the carrying charge for ore and pig iron no less than on coke and the manufactured products. In the meantime pig iron is dull, and prices have a tendency to sag rather than to advance. Those furnaces whose product is not fully covered as yet for the remainder of the year are in the market for small amounts of iron at the market rate, but decline to extend options at the quoted prices to exceed a month or six weeks, so that the price of iron in round lots and for long future delivery is firmer than would appear from the published reports of daily transactions here and in the Valley. Bar iron, while low in price, commands a ready sale, and very little of it can be bought for delivery earlier than November. Sheet iron is doing a little better, No. 24 selling at about $2.70 and No. 27 at $2.85 at Valley mills, the same numbers of refined sheets selling here out of stock at $3.25 and $3.45. Cut nails may be had at $1.55 at the mills, while wire nails are worth about $2.10. Metals are strong and firm, no change in price having occurred in the last week. Pig tin sells in this market at 22c. for Straits of Malacca, 22½c. for small pigs and 23½c. for bars. Antimony goes at 15c., bar lead at 6c. and pig lead is worth 4.9c. Spelter is strong at 7c. and Lake copper is quoted at 13c., with Arizona copper at 12½c.

TINPLATE THROUGHOUT THE WORLD.

The stupendous changes now taking place in the tinplate trade render interesting some reference to the past and present status of the industry throughout the world. According to the best information at hand, the manufacture of tinned vessels was known so early as the days of Pliny (A. D. 23), but it was not until the seventeenth century that the business became known to the world as such, Germany being the birthplace of the infant industry. Up to the middle of the seventeenth century the manufacture of this ware was confined to Germany, but soon after it obtained a feeble foothold in France and Great Britain. It was not until 1720, however, that the establishment of the industry in the latter country was seriously undertaken; but from that time forward it advanced with great rapidity. In 1750 there were only four works in existence in Great Britain; fifty years later the number reached nine; in 1850 there were thirty-four; in 1860, forty; in 1870, fifty-nine; in 1885, ninety-six, and in 1890, considerably over one hundred. No definite knowledge is obtainable as to the total product, but an approximate idea of this can be had from the following table, showing the exports only for the years stated:

Year.	Tons.	Year.	Tons.
1872	118,000	1887	365,000
1875	138,000	1889	431,000
1880	218,000	1890	419 000
1882	265,000	1891 (first half)	306,206

Of the half-year's exports of 1891, 263,225 tons were shipped to the United States.

Looking to the continent of Europe, we find that there are ten firms in Germany owning tinplate mills; eight each in Austria, Russia and France; two each in Italy and Poland, and one each in Hungary, Holland and Spain; but the product of all these works is small compared with any of the large works in Wales.

In the United States there were, at last authoritative advices, six companies actually making tin or terne plates in commercial quantities, three companies building tinplate plants on a large scale, and two others proposing to build tinplate plants soon.

INTERNATIONAL TRADE TRICKERY.

This from *Kuhlow's German Trade Review* (Berlin), is really amusing:

With regard the balance of American trade, warnings have been again sent here from the Germans in New York to our great industrial people, advising them to look carefully after those men who smuggle themselves into the factories under the guise of ordinary workmen in order to learn the tricks of the trade, but in reality they are instructed technical engineers who have been sent here by American business houses. They learn as much as they can by stratagem, and then try and worm the secrets of the business out of the initiated. Of course for these purposes only those who can speak German are of any use.

While our able German contemporary is in the business of exposing international trade trickery, perhaps it will conclude to go into the subject of fraudulently selling German cutlery under Sheffield trade-marks. Having done this, perhaps it might explain on what principles of common honesty German and English manufacturers enter into a business arrangement whereby "good, honest Sheffield cutlery" is stamped with the name of German works, and at the same time the Sheffield trade-mark is affixed to "rubbish made at Solingen or Remscheid." That, at least, is the charge openly made by leading English papers, and we have never seen it denied. The very best, it seems to us, that our Berlin contemporary can make of the practice in question is to demonstrate that the English manufacturer is a little more steeped in iniquity than his German customer.

Possibly interest might be added to the article by some reference to the recent industrial scandal in Westphalia, in which the director of the Bochum steel works is accused of employing material much inferior in quality to that ordered by the government railroads, and some explanation may be in order as to his defence, viz: that in all the German steel works it is customary to mix bad rails with good. American manufacturers are shrewd and wide-awake, but we have yet to hear of their stooping to the low plane of moral turpitude indicated by the above recent occurrences, which have been freely and openly charged for some time past by influential English newspapers.

TO A PROMOTER OF PIG IRON SPECULATION.

The Iron Trade Review **of Cleveland, says "the Chattanooga *Tradesman* is again overwhelmed with the beauties of the storage warrant system and gives a half column of its valuable space to an article on this subject. It is scarcely necessary to say that it fails to quote from the numerous articles now appearing in the leading iron journals of Great Britain condemnatory of this system."**

It is equally unnecessary to say that the *Review* fails to quote from leading English iron journals in support of the system. It's all owing to a point of view; the organs of the mills are against storage—that's all.—[The Tradesman, Chattanooga.

The argument of "you're another," is hardly worthy the high standing of our esteemed Chattanooga contemporary. The fact is, that *The Iron Trade Review* has published both sides of the question as viewed by its English exchanges, but the preponderance of comment is so overwhelmingly against the system that the extracts are necessarily one-sided. Our Chattanooga friend, on the other hand, has studiously avoided printing any extracts against the scheme and has for several months maintained a most discreet silence respecting a proposition put forward by us, viz.: that we would devote a page of this paper to reproducing such extracts in favor of the scheme as the editor of the *Tradesman* might furnish us, on condition that he would devote a like space to extracts from leading foreign papers that are opposed to the warrant system, the same to be furnished by us. Is there anything unfair in that?

PROOF OF THE TINPLATE PUDDING.

We are informed on excellent authority that the Robinson-Rea Manufacturing Company, of Pittsburgh, Pa., have been awarded a contract by the United States Iron & Tinplate Manufacturing Company, Demmler, Pa., for a 600 H. P. piston valve engine, two tinplate mills and several doubling and trimming shears. The latter company also ordered two tinplate mills from the A. Garrison Foundry Company, about six weeks ago, which are to be completed about September 1st, and which will be driven by an engine already at the works. The new engine is to drive, besides the two tinplate mills now ordered, a large sheet mill which is already at the works, and two more tinplate mills, a cold roll mill, and sundry other machinery necessary in tinplate works, and for which negotiations are now pending. W. B. Scarfe & Sons are building an all-iron tinning house for the company, and the Shiffler Bridge Company is erecting an addition to the main building. The Heine Safety Boiler Company, St. Louis, Mo., is now erecting a new battery of their water tube boilers at the tin plate works.

Of course the hide-bound opponents of an American tinplate industry will studiously avoid reference to such facts as the above, but they remain facts nevertheless, and they are worth a ton of Free Trade argument.

Recently the Hoerder Mines and Foundry Union, a very strong German trade organization, purchased a new desulphurization patent. *Kuhlow's German Trade Review* (Berlin), in referring to the matter, expresses the opinion that the patent is not of very much value, and predicts disappointment in the results of its use. It says:

"Without wishing to raise doubts in the minds of the members of the Hoerder Union as to the possibility of putting the desulphurization patent to practical use, we must warn against placing too great expectations in its employment. Our opinions are in no way altered since receiving the first reports upon the discovery. The Hoerder Union had formerly some experience with the Thomas Gilchrist patent which did not lead to any great results, and in spite of the millions which the Hoerder Union must have sunk in it the whole thing was in the highest degree unsatisfactory, whilst other works which do not busy themselves with the realization of a patent, but handle their business properly, bring in much better returns to the shareholders than does the above-mentioned firm. For the last mentioned raising the compact against the realization of the Thomasschlacke, has been of great pecuniary value or will bear rich results in the future. There is also a good chance that the committee of management, to which a technical and mercantile chairman has lately been elected, will next obtain for themselves a general directorship. In this case they would soon be enabled to come to a satisfactory settlement on all points.

WE hasten to state, on the word of the *(Un)-American Artisan*, that its opposition to the establishment of an American tinplate industry dates considerably back of the time when it was favored with the advertising contracts of the tinplate monopolists of Wales. But, come to think of it, the London *Iron and Steel Trades Journal* did not intimate that it assumed its position in consequence of its foreign patronage. The London journal was pleased to remark that the placing of advertisements in question by the Welsh manufacturers was in recognition of the able Chicago editor's efforts in their behalf. We trust our readers may be able to discern the difference.

"WHERE is the Native American Artisan?" doubtfully asks the *American Artisan* in a brilliant and labored editorial. If our esteemed contemporary desires information concerning an *American Artisan* that is purely foreign in its tastes, tendencies and affiliations, we think we can direct it to the right quarter.

THE delivery of iron ore at Lake Erie ports is going steadily forward, with a single exception. We understand that up to the

present writing Huron, O., has not yet entered the list of iron ore-receiving ports, though arrivals are expected daily. The docks are equipped with five Hulett hoists, and facilities are at hand for handling a considerable quantity of ore. It is stated that contracts have been made for the delivery of 20,000 tons per month until the close of navigation.

WATER GAS IN PUDDLING.

In a communication to the British Iron and Steel Institute, Mr. John Head gives a comparative statement showing the working of coal fired and the new-form (water-gas) Siemens furnaces respectively when puddling grey pig iron, which we produce below :

	"Coal-fired" Furnace (Single Puddling) during 10 Shifts.	New Form Siemens Gas Furnace (Double Puddling) during 7 Shifts.
	cwt. qr. lb.	cwt. qr. lb.
Pig metal charged	346 0 20	454 1 1
Yield of puddled bars	323 0 13	445 1 24
Loss of metal	18 0 7	8 3 4
	=5.2 per cent.	=1.9 per cent.
Scrap balls (bars made)	14 3 10	37 0 2
Yield of iron per shift	34 1 5	71 1 19
Coal used (including lighting up	410 0 0	149 1 0
Coal used (including lighting up) per ton of iron made	23 3 9	6 0 22
Coal used per ton of iron made (exclusive of lighting up)	22 2 26	5 2 7
Fettling used per ton of puddled bars	6 2	3 0 0
	s. d.	s. d.
Cost of fettling per ton of puddled bars	3 11	2 2
Cost of repairs per week	15 0	estimated at 5s.

The mixture of pig iron used was the same in both furnaces, and the puddled iron made in the gas furnace was distinctly superior to that made in the coal furnace, the rolled bars being cleaner and more free from rough edges.

It will be seen from the above comparative table that puddled bar was regularly produced from grey pig at a fuel consumption of 6 cwt. per ton of iron, the consumption of fuel for puddling the same mixture of grey pig iron in the grate furnace being 23 cwt. 3 qr. 9 lb. Steam was not raised with waste heat from the grate furnace, as the temperature required for working the pig iron puddled would not admit of boilers being added to the furnace; but when steam is raised by means of waste heat from puddling furnaces it has been ascertained that the evaporation does not exceed 3 pounds per pound of coal used on the grate, and from actual experiments made at Sheffield the evaporation was found to be only 2 85 pounds. While in independently fired boilers an evaporation of 8 pounds of water per pound of coal could easily be obtained.

To puddle, say, 40 tons of grey pig iron in grate furnaces with boilers attached, and to puddle the same weight of the same pig iron and raise the same quantity of steam in the new form Siemens furnace, the figures will stand as follows :

40 tons×23 cwt. 3 qr. 9 lb.=953 cwt. 0 qr. 24 lb. coal, which weight of coal will evaporate, at 2 85 lb. per pound of coal used, 2716 cwt. of water; to do the same work in the new-form Siemens furnace will require (40×6 cwt. 0 qr. 22 lb.)=248 cwt. of coal for puddling, and 339 cwt. for raising steam, or a total of 587 cwt., showing a saving of 39 per cent. in fuel in favor of the new-form Siemens furnace.

One of these furnaces, the one from which the above record is taken, is in use at the Pather Iron Works, near Glasgow, and is in regular use, besides which several others in different European works are in course of construction.

TEMPERING STEEL ON A LARGE SCALE.

The Bethlehem (Pa.) *Times* says: The tempering house building is situated at the extreme southeastern end of the Bethlehem Iron Works, at the base of the mountain. Here the guns, shafts, armor plates and other material are subjected to processes called tempering and annealing. The tempering house is about 300 feet long. The western end of the building is almost as high again as the rest of the structure and shoots towerlike into the air. The object of tempering is to render the metal as tough as possible and to reduce the degree of brittleness to a minimum.

Close to these furnaces is a gigantic stationary hydraulic crane 50 feet high, a powerful concern, the chains whereof are formed of links as large as a man's hand, and whose lifting capacity is 25 tons, which could be doubled or trebled if desired. Besides the stationary crane there is a traveling pneumatic crane spanning the building from side to side and running on a track extending the entire length of the structure. Close by the furnace is the large tank. Suppose a cannon tube 30 feet long is to be heated to the required temperature in the vertical furnace. The doors are swung open; the shaft is grasped by the hydraulic crane and it is veered around till its huge arm and the pendant shaft are directly over the yawning tank. The shaft is then lowered into the liquid until entirely immersed. The length of time articles are allowed to remain immersed varies with the size of the piece.

After being thus ducked, the metal is submitted to the process of annealing. This is the subjection of a substance to a certain heat, and then allowing it to cool gradually for the purpose of removing brittleness and improving temper and ductility. To this end the metal is placed, by means of the traveling crane, into an annealing furnace, of which there are about a dozen various shapes and sizes in the building—some circular, some rectangular and some square. In these the metal is again heated, and then is allowed to cool slowly. The cooling is graduated according to specific regulations so that it may, when cooled, retain precisely the proper temper. After being finished at the tempering house the metal, whose condition has at various times been previously ascertained, is again tested, and, if satisfactory and accepted, is ready for shipment; the material made under private contract being sent to the proper destination, and the articles made for the army and navy shipped to the arsenals, navy yards and ship builders, as may be designated by the government officials.

Tempering house No. 2 is the easternmost structure of the iron works, being situated to the side and back of the hammer building. The two principal objects and contrivances besides the annealing furnaces here are the large heating furnaces and the oil tanks. The heavy pieces will here, as elsewhere throughout the ordnance department, be handled by pneumatic cranes.

The tanks are made of boiler iron firmly riveted, and are splendid specimens of workmanship. They are surrounded by masonry built in the form of circular juts, which bear no distant resemblance to large cisterns. The boiler house connected with the hammer building is a large iron structure situated west of that building and the number three machine shop. The stack is 220 feet high, the altitude of the Bunker Hill monument. It does not claim the degree of conspicuousness, however, enjoyed by that noble cenotaph, for the Bunker Hill concern is situated on a considerable elevation, which tends to make it appear higher than it really is. This stack, on the other hand, is placed in a depression many feet below the level of other buildings. At present the building is only half filled with boilers, there being eight pairs now in place.

THE WORLD'S IRON PRODUCERS.

The London *Ironmonger* has lately been investigating the statistics of its own and the other countries in regard to their production and consumption of iron and steel and their bearing on the future of these industries. Evidently the outlook, from a British point of view, is not at all exhilarating for it says: The figures, in many respects, are almost grave in their import, inasmuch as they reveal a somewhat remarkable rate of progress in the United States and Germany, a steady increase in France and Belgium and Austria-Hungary, a capacity for almost complete self-supply in Russia, and a tendency in many other parts of the world to obtain supplies of iron and steel from countries other than Great Britain. Perhaps the leading inference to be drawn from the statistics is that at no distant date the United States will be compelled to open up export markets for its surplus iron and steel products. The wants of the home market there are enormous, and must increase as the population grows larger, but the growth of the iron and steel trade is even more rapid; hence it is tolerably certain that every time the home market falls, flat augmented efforts will be made to ship American iron and steel abroad. Should these efforts prove successful, the foundations will be laid for a regular export trade, and if the cost of production can be lowered, or "slaughter-house" prices arranged, we shall find American iron and steel in strong evidence throughout the West Indies, Central and South America, and, possibly, in certain other parts of the world. It needs no pessimistic frame of mind to arrive at this conclusion, but merely a careful study of the statistics from a comparative standpoint. We have lost our premier position as producers of pig iron, as well as of Bessemer steel, the first place in both respects being taken by the United States. In the production of manufactured iron, including rails, the United States stands first, Great Britain is second, and Germany is a very good third, the same order being observable as regards Bessemer steel ingots.

The basic process, as is well known, has been the cause of the great increase in steel production in Germany. In respect of open-hearth steel we are well ahead of all our competitors, our make being 1,564,200 tons last year, and that of the United States 513,232 gross tons. No separate returns as to this grade of steel are available for the other countries. The following figures show the exports of iron and steel of the leading countries in 1890 :

Great Britain	tons	4,001,430
United States	$	27,000,134
Germany	tons	950,724
France	"	280,197
Belgium	"	560,975
Austria-Hungary	"	60,322

From most of the countries there are no details of their iron and steel exports *by destinations*, consequently no full comparison or analysis in that respect can be made.

The figures show that in certain parts of the world German iron and steel have secured a very considerable consumption, although we are still far ahead of all competitors, and even to Germany send nearly five times as much iron and steel as we buy from that country. France imports only about one-seventh as much as she exports, while Belgium imported last year 323 689 tons, against an export of 560,975 tons. Austria-Hungary imported 108,119 tons, and exported 60,322 tons, the imports being smaller and the exports larger than in 1888 it supplied 90 per cent. of the pig iron, 85 per cent. of the finished iron, and 96 per cent. of the steel consumed in that country. In Spain, Italy and some other countries a similar process of development is in progress, which is of some present assistance to our manufacturers, but forebodes competition in the respective home markets in course of time.

England's Hardware Trade Depressed.

It is reported from Birmingham that the demand for guns from Australia and South Africa is improving, and that there is slight recovery in all branches of the iron and hardware trades. Exports are affected, however, by the price of exchange with India and financial and political troubles in South America. There is no perceptible improvement in the Sheffield trades, speaking generally. It is felt that the worst effects of the new American tariff on the cutlery trade of Sheffield have not yet been felt, as the United States Government is making efforts to secure the South American markets which the Sheffield cutlers felt were still left to them. Sheffield file-makers are feeling the effect of a fall off in demand from Argentina.—[Hardware.

IRON-MAKING AT DULUTH.

The Duluth *News* of recent date, says: A. J. Trimble who is largely interested in iron properties in Minnesota and Wisconsin, lately returned from the Gogebic range. During a conversation Sunday evening with this gentleman the subject of reorganization of the Minnesota Iron Car Co. was brought up. "The gentlemen interested in this movement," said he, "recently asked me for considerable information concerning the Duluth Iron & Steel Co.'s coke furnace at West Duluth, evidently with the intention of purchasing this property if they succeed in putting the car plant on a satisfactory basis for profitable operation. They asked me about limestone and coke, where the former could be secured and whether it would pay better to manufacture the coke here or ship it from the coal fields. They seemed to be inclined to favor the latter idea, but as it breaks up coke considerably to handle it and thereby impairs its usefulness, they thought it would be better to ship it entirely by rail. I told them the best way to procure limestone would be to ship it by boat from Kelly Island in Lake Erie, as this is the best stone known for blast furnace purposes, and they seemed to favor that idea. For my part, it would seem to be a much more feasible plan to operate a charcoal furnace here, as all the necessary material is close at hand; still the coke furnace is already built and undoubtedly for the present coke pig would find a more ready consumption in this immediate vicinity than that made from charcoal, as charcoal pig is of much better quality and would have to be shipped long distances while the coke iron could be utilized close at home."

Speaking of the large profits made by the Ashland charcoal furnace, Mr. Trimble said: "The main reason why the Ashland concern is so extraordinary profitable is because it is situated so close to the Gogebic range and the management is enabled to buy iron at very low figures. There are large quantities of ore taken out of all the mines down there which is so low in iron as to make it unprofitable to ship it to Cleveland. The Ashland company buys this iron at its own price, which is often less than it costs to mine it, and consequently has what may be known as a 'snap.' Of course the same conditions prevail here. All the mines on the Vermilion and Mesaba ranges have on hand and are constantly mining large quantities of this iron, which is considered as so much waste. A furnace in Duluth could use such ore and make big money out of it."

"What do you consider the prospect of the iron ore trade?" asked the reporter.

"At present it is not very bright. Nearly all the smaller mines on Lake Superior are entirely closed down on account of low prices and the large mines only continue to ship ore because their stockholders are the owners of different railroads, and they ship to keep the roads busy, in this way holding quite an advantage over the smaller mines. Exploring and development are at present almost at a standstill. On the Gogebic new work is suspended entirely, while on the Minnesota ranges the only new properties being worked are the Mallman, Great Northern, McDonald, McComber and Anderson. Ores from new mines can not be sold in a dull year, as the furnacemen prefer to handle the old ore because no two ores will run alike in a furnace, even if they assay just the same. Even in a good year iron from new mines will not sell for as much as that from the old.

"But I see a light breaking in the distance—and the distance is not very far, either. There is a promise of a bountiful crop in America this year, especially in the Northwest, and when crops are good railroad men begin to talk extensions, stocks go up and iron goes up and sales are lively in consequence. The present low production of ore will have it result in reducing manufactured stocks, and if the crops are as good as they now promise you will see a scramble for ore among the furnacemen this Fall and consequently a considerable boom in iron properties and active exploration and development."

Mr. Trimble will go up on the Mesaba range this week to look over the properties there in which he is interested.

A GREAT IRON ORE COMBINE.

It is stated that the Chicago & Minnesota Ore Co., the owner of 27,300 acres on the Vermilion and a majority of the stock of the Chandler mine, is to be consolidated with the Minnesota Iron Co., owner of the Tower mines and the Duluth & Iron Range Railway. As matter of fact the Duluth *Herald* learns that the deal is a good deal larger than this.

The Chicago & Minnesota Ore Co., the Chandler Iron Co., the Chippewa Iron Co, the Norma Iron Co., the Delaware Iron Co., and the Canton Iron Co., as well as the Duluth & Iron Range Railway and the Minnesota Steamship Co., are all owned in great part by stockholders of the Minnesota Iron Co. It is proposed to consolidate all these, giving one company that will own every mine that is at present shipping ore, the Duluth & Iron Range road and a total land holding of about 40,000 acres. The capital stock of the Minnesota Iron Co. is $14,000,000, of the other mining companies $2,200,000, and the combined capital will be about $17,000,000.

The Chicago & Minnesota Ore Co. owns 27,300 acres of mineral land on the Vermilion range, and in addition to this holds a control of the stock of the Chandler Iron Co., which has made a very large amount of money and of late has declared no dividends. The Minnesota Iron Co. will purchase the stock of the Chicago & Minnesota Ore Co., giving one and one-fourth shares of the stock of the Minnesota Iron Co. for one share of stock in the other. The stock is held mainly in Chicago, New York and Cleveland. This deal turns the Chicago & Minnesota at about $90 a share.

The scheme is the greatest ever carried out in the West and gives the Minnesota Iron Co. a tremendous power.

It does not, however, give the Minnesota Co. control of all iron properties in Minnesota as has been stated. No one who knows believes the Minnesota Iron Co. alone has nearly 1,000 acres of good iron bearing lands. In township 62 14 it is contesting directly or indirectly several claims that will no doubt be very valuable, but much of its lands are like hundreds of other claims, untested and therefore doubtful. This combination does not own half of our best prospective iron lands, nor the Macomber, Sheridan, Zenith, No. 26, Great Northern, McDonald or Anderson on the Vermilion, or the Mesaba syndicate, Mallman, Myrna or Mountain Iron Co. on the Mesaba range and who will deny these properties are not all showing for good mines and will be shippers in the near future. This list only covers a part of the good properties owned by parties outside of the Minnesota Iron Co.

IRON ORE AND IRON-MAKING IN TEXAS.

A number of prominent Texans lately visited New Birmingham and Rusk, twin towns which are the site of the only iron-making furnaces in the State, and judged by the following extract from the Houston *Post*, they were evidently much impressed with the iron resources of the place. Possibly the language used is a little too strong, but New Birmingham and Rusk undoubtedly have great resources in the way of iron ore if the reports of able experts can be depended upon. The *Post* says:

The gentlemen who visited the iron fields in Cherokee with the Governor last week were amazed at the visible quantity and tested quality of the ore. Said Comptroller McCall: "Why, sir, 52 per cent. of everything in sight within the mineral area is iron, and there is enough there to steel-plate the globe an inch thick and leave enough to keep the Goulds and Vanderbilts and Inmans in rails for a thousand years. The hills are built of iron ore; the valleys are paved with it; the very soil, every inch of it, is so richly impregnated with the ore that it might be profitably smelted, but that is used for growing corn and cotton, potatoes and watermelons."

The pipe works at New Birmingham have no occasion to smelt the ore as a preparation for molding, but it is run direct from the furnace into the molds, just as the pig iron is formed. The blacksmiths of the country now use the ore in their furnaces, and all report a high grade of iron. There are always two furnaces in operation, the Tassie Belle at New Birmingham and the "Old Alcalde" at Rusk. Besides these the Star and Crescent is in process of building, and other enterprises of similar character are projected.

There can be no question that Texas has all the iron ore deposits she will require for the lifetime of our civilization, and there is none better on the earth or in it. A few miles of new railroad will bring this great industry into active and profitable operation, and the time is not far distant when she will be a seller instead of a buyer of steel rails, car wheels, stoves and the ten thousand articles and implements of husbandry that she is now procuring from abroad at long-haul rates.

A Railway Motor Car That Uses Power in Several Forms.

A motor car that embodies several new ideas in the application of power has been in service for some months at Pullman, Ill., and has attracted the attention of many street railway men. The machinery in the car consists of a 10 horse-power gas engine, designed to burn gasoline, a 10 horse-power dynamo, a battery of 100 accumulator cells, and a 15 horse-power motor suspended from the front truck. The gasoline is stored in a tank suspended from the ceiling, and is fed automatically into the engine. The dynamo driven by this engine delivers its current into the accumulator cells while the car is standing, but when the car is in motion both the storage battery and the dynamo send their current into the motor.

On level ground, where little power is required, the motor can be run with the dynamo alone, saving the energy stored in the accumulators for future use.

The car has attained a speed of eleven miles while drawing a loaded trailer. The engine consumes about one and one-half gallons of gasoline per hour. Thus the cost of fuel for a continuous run of eighteen hours would be but $1.62, at the rate of 6 cents per gallon for gasoline. The accumulators are placed beneath the seats of the car, and need be seldom if ever removed from their position.

On the Road to Success.

The Atlantic Pacific Railway Tunnel Co. is pushing straight ahead to success, working day and night, in both ends, to meet in the center of the Rocky Mountains. The tunnel is now 4,000 feet, east end, and 1,600 feet west end, and proceeding about seven feet per day. The last car load of ore as got out and sold July 16, 1891, weighed 21,151 pounds, a trifle over 10½ tons. It yielded $17 per ton of gold; $62 per ton of silver, and lead 36 per cent., netting the company $678 40 for the car load, after all charges for freight, sampling and smelting were paid. This tunnel aside from its use for mining purposes will be used by an independent direct railway line between Denver and Salt Lake City. Its properties are immensely valuable and all paid for. Its taxes and labor bills are all paid. All interest due on the 8 per cent. bonds is paid promptly, and it is driving ahead with its work for the benefit of all shareowners, with the proceeds arising from the 8 per cent. bonds it is now selling. They are among the best and most substantial securities in this country. Those wishing to know the merits of this great enterprise in Colorado, the greatest of the kind in the world, will receive a large pamphlet giving full particulars by addressing Mark M. Pomeroy, General Manager, Atlantic Pacific Railway Tunnel Co., Rooms 46, Pulitzer Building, New York City.

PRESIDENT MILLER, of the Nicaragua Canal, says he has money enough in sight to carry the work of the canal along for two years without making further financial arrangements.

NICKEL PLATE Ninth Annual Niagara Falls Excursion runs August 17th. Enquire of Nickel Plate Agents.

LAKE SUPERIOR MINING NOTES

The force of men at the Chapin mine is being increased, and shipments of ore amount to about 3 000 tons per day.—[Iron Range.

The last pay-roll of the Ludington amounted to $28,000. About 600 men are now employed at the mine, the number being 150 more than were employed last season.—[Iron Range.

During the month of August it is probable that the sinking in No. 2 will amount to about 90 feet, and this will make the shaft 1,280 feet in depth. For the championship in rapid sinking in lime rock we think the Hamilton people rank first and a bran new broom will be nailed to the shaft house to indicate their superiority. And it will stay there too, until some one beats the record attained at this mine.—[Iron Range.

The work of opening up the 14th level at A shaft of the Ludington is progressing quite satisfactorily, and by the first of next month two new rooms will be opened. C shaft will soon be down to the 14th level and then a drift of 200 feet will be made to connect that shaft with A shaft. After a few more rooms have been opened at A, the daily output of ore from that shaft will probably run up to nearly 500 tons. B shaft is now about 50 feet below the 11th level and sinking is steadily progressing.—[Iron Range.

Officials of the Iron Mountain & Huron Bay Railroad, now nearing completion, have made a rate of 40 cents per ton between the mine and water. This is a practical cut of 20 cents per ton.—[Negaunee Iron Herald.

The Escanaba River Land & Iron Co. shipped its first cargo of ore yesterday. It was 65 per cent. in metallic iron and safely within the Bessemer limit. The mine is looking well, the new deposit under the old Swanzy workings being 68 feet in width. Arrangements have been made to sink an additional 100 feet and open out the ground for active mining.—[Negaunee Iron Herald.

A new find is reported at the Mansfield. Monday while the dam in the Michigamme river was down and the water very low at a point near the mine, a fine outcropping of ore was found in the bed of the river, which has a continuous length of between three and four hundred feet. The ore is almost identical with the product of the mine and assays within the Bessemer limit. —[Diamond Drill, Crystal Falls.

At the U. S. Grant mine they are still sinking, and at last accounts were 10 feet in ore of finest quality.—[Iron Ore, Ishpeming.

The shaft at the Barassa is going down at the rate of about 8 inches per day. The flow of water is enormous, something like 1,200 gallons being lifted each minute. The company hopes for a decrease of this volume when more rapid progress in shaft-sinking could be made.—[Iron Ore, Ishpeming.

At the Dexter will be considerable diamond drilling done, a contract having been awarded to M. E. Harrington & Son, who will soon have drills in operation. It has been decided to give the lands of the company a thorough exploiting. They are favorably located, and should give something valuable. The company has been persistent in its search for a mine, but thus far has confined its operations to a single point.—Iron Ore, Ishpeming.

The new shaft at the Mitchell end of the Winthrop has reached a depth of 370 feet, remarkably good headway since the time it was begun. The company is also sinking the old shaft at this place to secure ore in close proximity thereto. The explorations on the south side of the Winthrop are still in progress. The drill has cut one hundred feet of quartzite, passing through it, but as yet has found no ore of value. It is some distance to the diorite, and there is plenty of room for a mine before this point is reached.—[Iron Ore, Ishpeming.

Capt. C. T. Roberts has discovered and is working a deposit of manganese near the Mastodon mine. Deposits of manganese are of frequent occurrence in this section, but this is the only instance, with one exception, where it was found in quantity enough to pay working it separate from the iron ore which accompanies it. The Roberts find was an outcrop; the length or breadth is not known, but the depth is from six inches to three feet, under which lies from four to six feet of bog ore, then 30 feet of sand lying on the ledge, which is jasper and lean ore. About 1,000 tons of manganese is in stockpile and the find bids fair to add many thousand tons before it exhausts. Supt. E. P. Jennings and J. Kellerschon have made five analyses of the ore up to date, the best return being as follows: Iron, one-half of one per cent.; phosphorus trace; silica, 3 00; manganese, 61.50. The lowest return is: Iron 17.46; phosphorus, .064; silica, 9 10; manganese, 29 81, while the remaining three gave the percentage of manganese at 51.50, 50 84 and 48 30. This will safely strike an average of 40 per cent. of manganese, which at the present market price brings 34 cents per unit of manganese and ten cents per unit of iron, or about $15 per ton.—[Diamond Drill, Crystal Falls.

From three to ten cars of ore are daily shipped from the Paint River mine; 20 cars could be sent out, but the cars are not provided. About 15,000 tons have been moved for this season and the local management does not know how much more will follow. The property is in condition to meet all demands.—[Diamond Drill, Crystal Falls.

More men are being put to work at the Nanaimo mine, in the Iron River district, and the work of hoisting ore for the market will soon be commenced. The Beta mine, which joins the Nanaimo and is a part thereof, will also be pumped out and ore shipped from that property.—[Diamond Drill, Crystal Falls.

If there was ever a bright time in the history of the famous McComber mine on the north shore of Armstrong lake in 62 14, that time is now. A week ago a well defined vein of ore was struck in the west drift over 100 feet from the mouth of the shaft at the 110 foot level, and the week's work has shown up a most encouraging state of affairs in this portion of the exploration. Up to Wednesday evening they were in an excellent quality of ore a distance of 41 feet and still tunneling. Crosscuts will be commenced this week, and there is little doubt that Capt. W. H. Whiteside has struck the regular vein that exists there. The McComber has always shown up well in ore, but the regular trend of the vein was never satisfactorily located. Vermilion veins, unlike the Mesaba, are so marked and more systematic in their formations, that the location of it is reason for congratulation. An important point in the development history of the McComber has just been passed and we may expect an advancement at this property never before equaled.—[Vermilion Iron Journal, Tower, July 30.

BUILDING CHIMNEYS OF STEEL.

Steel is being used in the construction of the immense chimney of the Fair building at State, Adams and Dearborn Sts., instead of brick. The chimneys of the Leiter building, at State and Van Buren Sts., will also be constructed of the same material. This new feature of construction has been introduced by Architects W. L. B. Jenney and W. B Mundle. The chimney when completed will be 250 feet high, being considerably higher than any other in the city. The outside diameter is 9 feet 5 inches, while the steel varies in thickness from five-thirty-seconds at the top to three-eighths of an inch at the bottom. The lower 75 feet of the chimney is lined with fire-brick eight inches deep, formed to fit the shell compactly all around. Above this it is lined with hollow tile. This lining is supported at intervals of 25 feet by angle-iron riveted to the steel shell; in other words, the chimney is lined in a manner similar to blast furnaces and foundry cupolas, and no expansion by heat can lessen its strength. The joints are all hot-riveted. The steel shell is carefully protected from corrosion and from any attacks by the weather by painting inside and out. The weight of the chimneys is spread to the foundations in the same general way as that of the columns of the building, the base or foundation on which it rests being constructed in the same manner. The ground first is covered with a layer of cement, then two layers of steel rails in cement and one layer of I-beams, on which the cast-iron shoe which takes the shell of the stack rests. The capacity of the chimney is twelve 60-inch boilers 20 feet in length. The chimney is now up to a height of 150 feet. The cost will be about $7,000 In the one to be constructed in the Leiter building the diameter will be a trifle larger, being 10 feet 3 inches, while the height will not be so great, being calculated at 200 feet. This will afford an escape for the smoke from the fire boxes of nine 72-inch boilers, each 20 feet long.

This is the first time this material has been used in the construction of the chimneys of mercantile buildings. The magnitude of the building and the necessity of economizing in space, the foundations for the columns occupying about all the ground, led the architects to adopt steel as the material for this purpose. Brick has been used almost entirely heretofore, but upon investigation it was found that the weight of a brick chimney of this size would be almost 700 tons, while of steel construction it would weigh, including the linings, a little less than 250. The outside diameter of the present chimney is 9 feet 5 inches, while were it constructed of brick it would be 16 feet 6 inches, thus making a great saving in space.—[Chicago Journal of Commerce.

A New Tribute to the Tariff.

The growing prosperity of the country and its increasing commerce are driving the tariff reformers and free traders into an uncomfortable corner. They have said very little about the results of the new tariff as disclosed in the recently published Treasury report, and have generally evinced of late less inclination to discuss the Protective policy. If the tariffites could persuade everybody else to keep similar silence they might be happy, but they cannot. Even their friends will talk indiscreetly. Here is the British Consul General at New York, Mr. W. L. Brooker, frankly admitting in his report to Her Majesty's Government an improvement of American manufacturing interests under the new tariff. "New life has been imparted to the cotton, woolen, worsted and knit underwear industries," he says, and then goes on to describe a healthy condition of the textile manufacturing interests all over the country, but especially in the South. The production has been of larger volume than ever in cotton goods, and Consul Brooker is authority for a statement that the McKinley tariff is responsible for this. As to worsted goods, Mr. Brooker states, "this industry has been marked by fresh life since the new tariff has to a great extent cut off the importation of the lowest grades of such goods. All the old factories have started up, and are making goods on safe orders; and new mills are being erected by European and British capitalists with a view to manufacturing a finer class of dress goods than ever before."

This is evidence from an unexpected quarter that the McKinley tariff is a protector of domestic industries and a means of fostering new enterprise in this country's manufactures. An English consul has no inducement to falsify in this direction. We believe that it will be six months, or possibly even a year yet before an adequate estimate can be made of the full effects of the McKinley bill; but it is interesting to note that, as the returns come in, they are favorable, and just the opposite of opponent's predictions.—[Pittsburgh Dispatch.

CHAUTAUQUA Excursion free, Toronto Excursion $1.00 extra, Lewiston Excursion 25 cents extra. These side trips are arranged for the Nickel Plate Ninth Annual Niagara Falls Excursion of August 17th. Enquire of Nickel Plate Agents.

Rapid Steel Making.

On the night of July 6, the second turn in the converting department of the Edgar Thomson Steel Works, of Carnegie Bros. & Co., Limited, at Braddock, Pa., made 60 heats and turned out 930 tons of steel. The best previous record in one turn was 850 tons.—[Iron Age.

NICKEL PLATE Excursion August 17th. Ninth Annual Niagara Falls Outing. Chautauqua Free. Toronto $1 00 extra. Liberal limits. Stop over to visit friends granted on return trip at Brocton or points west. Enquire of Nickel Plate Agents.

THE HERBERTZ CUPOLA.

The Herbertz cupola, herewith shown, instead of being blown by the blast forced from below through the melting material, as in ordinary practice, is provided at its upper end with a steam jet pipe, which in action creates a vacuum of from 3 inches to 4 inches of water in the upper region of the cupola, while the air is allowed to enter freely at the lower part through an annular opening between the movable hearth and the upper shaft.

The movable hearth is mounted on four screws, which by their common action, lower or raise it at will and thereby allow of a complete and easy regulation of the quantity of blast introduced through the annular opening. The screws work either in the standards of the cupola, or are carried on a special car together with the hearth, so that this latter can be removed at any moment from underneath the shaft. The steam jet is applied in the center line of the smoke pipe, which connects the cupola either directly with a special stack or is built like the downcomer of a blast furnace, and connects the cupola with a horizontal underground flue leading to any chimney. The top of the cupola is provided with a hopper hermetically closed while the melting is proceeding and only open at regular intervals and for a very short time, when the charge is being introduced.

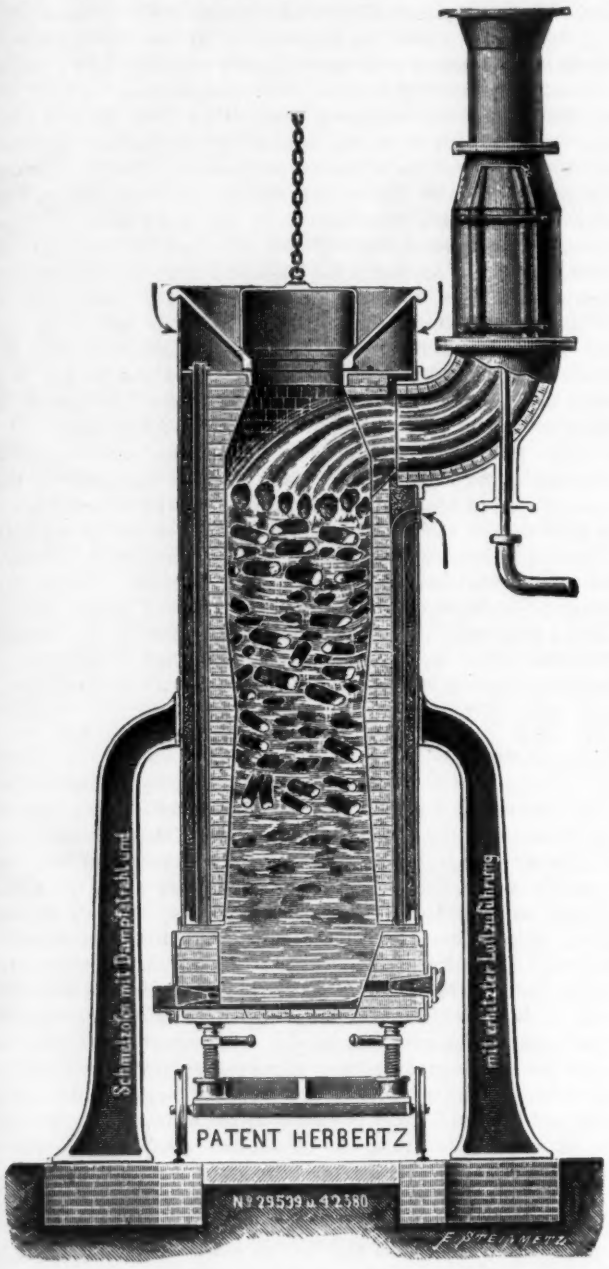
The bottom of the hearth is provided with a door turning on hinges and kept tight by a lock. This door, once lowered after the melting is done, turns around the hinges and the contents of the cupola are dropped into an ash pit, where, after having been cooled with water, the unburnt coke can be collected and saved for the lighting of the cupola in the next melting.

Three tuyeres are placed all around at the level of the bottom of the hearth. These tuyeres, as we shall see later on, are plugged up with sand during the melting, but are used before the melting in the kindling of the fire and to give access to the air necessary for the combustion.

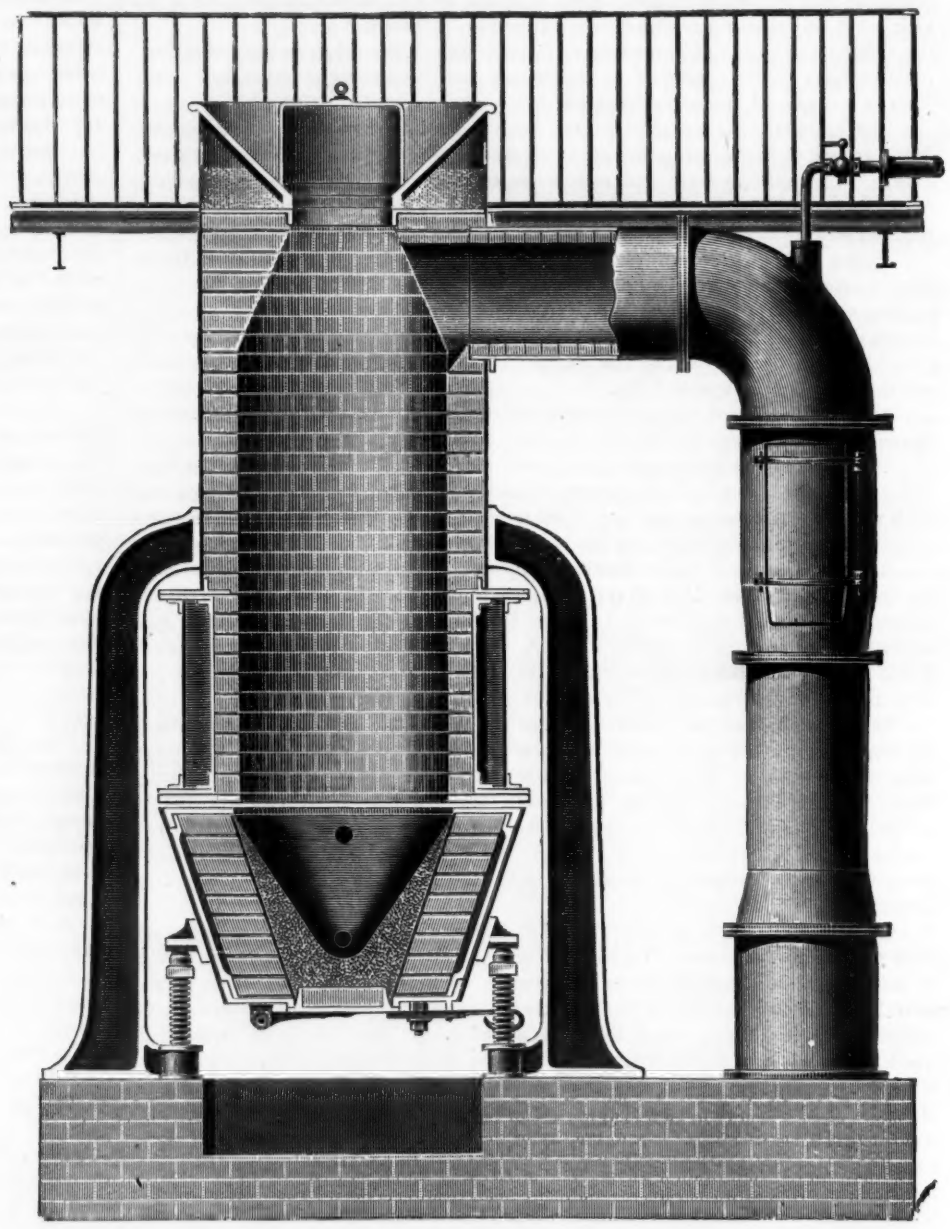
The shaft is provided at two different levels with bullseyes, through which the fire can be watched.

The application of a steam jet to create draft in the cupola has many advantages. The only mechanical appliance required is a small boiler supplying the necessary steam for the ejector. No blowing engine or steam engine with blower, shafting, pulleys, belts, no blast pipe connecting the blower with the cupola, is necessary. The only repairs are those on the boiler and steam pipe, very light indeed, without mentioning the fact that oil for lubricating will be entirely dispensed with. But beside these already important advantages some other features are met with. Most of the blowers, running at a speed of from 1,000 to 1,200 revolutions or more per minute, produce sometimes noise, which often can be heard at a great distance. The Herbertz cupola runs without any appreciable noise and can be established in any populous center without the slightest inconvenience to the neighborhood. Its top being closed, no sparks or flame are thrown out. The repairs to the movable hearth are very easy and can be done outside.

The cupola is very well adapted for the melting of pig iron. The very reduced consumption of coke, claimed by the inventor to be as low as 4 to 5 per cent. of the weight of iron (or in other words, one pound of coke would be enough to melt 20 pounds of iron), leads to the conclusion that the combustion of coke must be complete, or that the coke must be burnt completely to carbonic acid, and thus generate the greatest possible amount of heat. In order to prove this, test heats have been made in Europe, and the analyses of the escaping gases showed that in most cases the whole amount of carbon was burnt to carbonic acid, while in a few other cases a very small proportion of carbon burnt to carbonic oxide. In one of these test heats the mixture in the cupola was 1,050 kg. of Luxemburg foundry iron No. 3 and 450 kg. of foundry scrap, a total of 1,500 kg., or 1 5 tons.



Section of Cupola Showing the Mounting of the Movable Hearth; also Showing Ducts for Heating the Air of Combustion, for Smelting Steel and Other Refractory Metals.



Section of Cupola for Reduction of Ores.

THE HERBERTZ CUPOLA.

The melting coke was air dry and contained but 3 per cent. of water, 6.8 per cent. of ash and 1.037 per cent. of sulphur; 190 kg. of filling coke was put in the cupola and on top of it 1,000 kg. of pig iron. The total amount of coke used, including lighting coke, was 215 kg. to 1,500 kg. pig iron. After the fusion was done, 67 kg. of coke was taken out and could be used again for the next day's charge, so that the real amount of coke used was only 215—67=148 kg., or 9 9 per cent., whereas the real amount of melting coke was only 5 per cent.

A careful weighing of the iron cast showed that 1.460 kg. of 97 33 per cent. of the original iron charged, was obtained, constituting a loss of only 2.66 per cent. The temperature of the molten metal was high, and amounted in part to 1,300°. The escaping gases had the following composition:

	Carbonic acid.	Carbonic oxide.	Oxygen.	Nitrogen.
Before the steam jet was acting	7.1	0	7.1	85.8
Five minutes after the steam jet was acting	13.1	0	6.5	80.3
Twenty-five minutes after steam jet was acting	9.25	0	7.0	83.75
At the end of the cast (after 35 minutes)	13.3	0	6.3	80.4
Average	10.71	0	6.73	82.60

Another test heat with thoroughly wet gas coke was made. This coke contained nearly 20 per cent. of water and 7.5 per cent. of ash. About 12.7 per

cent. of it was used (lighting and melting coke together). The loss in iron in this charge was only 3 45 per cent. The average composition of the gases was 11.5 of carbonic acid, 3.4 of carbonic oxide, 8 2 of oxygen, 76 9 of nitrogen. It will be seen that in this last heat carbon did not burn entirely to carbonic acid, which was probably due to the increased amount of coke that had been charged intentionally.

The first tests made in the Herbertz cupola to melt steel were attended with success. Rail ends, old files and other iron or steel crop ends were melted together with a small amount of foundry iron, and with only 8 to 10 per cent. of lighting coke. The molten metal was liquid enough to be cast easily. However, when small steel castings had to be made it was soon discovered that the metal lacked fluidity, and in order to obtain better results, it was deemed advisable to work with heated air.

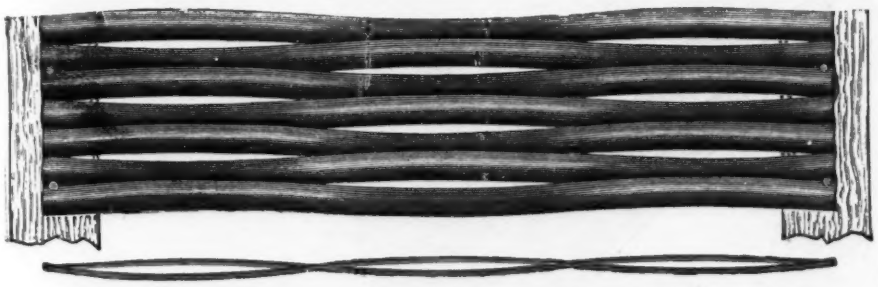
The cupola in all its parts is entirely similar to the steam jet cupola used for the melting of pig iron, with the exception, however, that a certain number of wrought iron pipes are laid in the brick work. The air enters at the top in a circular space, and from there is sucked down at once through the iron pipes to the lower part, where it enters the cupola. By its passage through the pipes it is heated to a temperature ranging from 500° to 1100° F. and consequently the temperature in the melting zone will be sufficiently increased to obtain a thoroughly liquid steel. Bessemer steel, as well as wrought-iron crops, were melted in this way each separately and with the greatest success.

For the casting of heavy steel castings especially this cupola is better adapted than a crucible. On account of its direct contact with the fuel at a high temperature, the percentage of carbon in the metal seems to slightly increase. No steel-melting cupola is as yet working in the United States, but on the Continent of Europe their value seems to be more and more appreciated.

For melting other metals or alloys, such as lead, copper, brass, &c., the cupola has recently been introduced in some European works. Especially bronze has been melted in an ordinary foundry cupola with the best results. The temperature required in this case being lower than in the case of pig iron, the cupola worked with natural draft and without any use of the steam jet. The fuel economy obtained seems to be very large. The total consumption amounted to only 12 per cent., whereas in crucibles this consumption is sometimes as high as 40 per cent. The fusion, even without the application of the steam jet, is claimed to be nearly five times quicker than in the crucible furnace, and the bronze obtained is even purer than the bronze remelted in crucibles. This is said to be due to the fact that during the fusion the small amount of tin often found in bronze is burnt out and escapes in the shape of a white smoke. The loss of metal during the melting seems to be slightly increased on account of the elimination of the tin. The cupolas used in the remelting of these metals are the same as those used for the remelting of foundry iron.

IRON AND STEEL ROOFING AND METALLIC LATH.

The Garry Iron & Steel Roofing Co., located at 152–168 Merwin St., Cleveland, are calling the attention of the trade to some of the specialties they are manufacturing and placing on the market this season in the way of metallic siding and lath. Many parties desire something more attractive in appearance than the ordinary corrugated, crimped or braided siding, which have



FIF. 3.—FIRE-PROOF METALLIC LATH.

been on the market for so many years, and it is to meet this demand they have introduced these new styles of material.

Fig. 1 shows the steel pressed brick ready for application. This has the appearance of the finest brick made. It can be applied by any mechanic

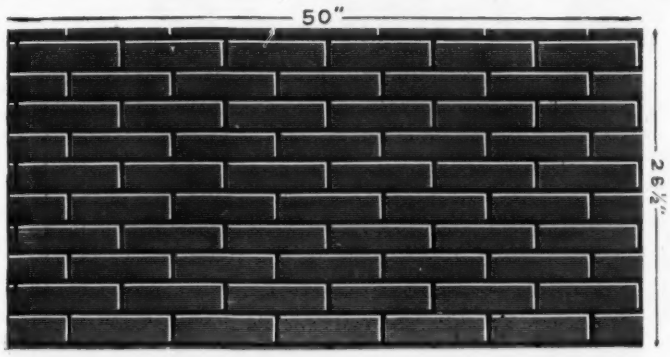


FIG. 1.—SHEET STEEL PRESSED BRICK.

with no waste and lays perfectly smooth. This costs nearly four-fifths less than common brick.

Fig. 2 shows an imitation of clap board siding which is made from iron or steel. This makes a very handsome siding and has the appearance of wood clap boarding when applied.

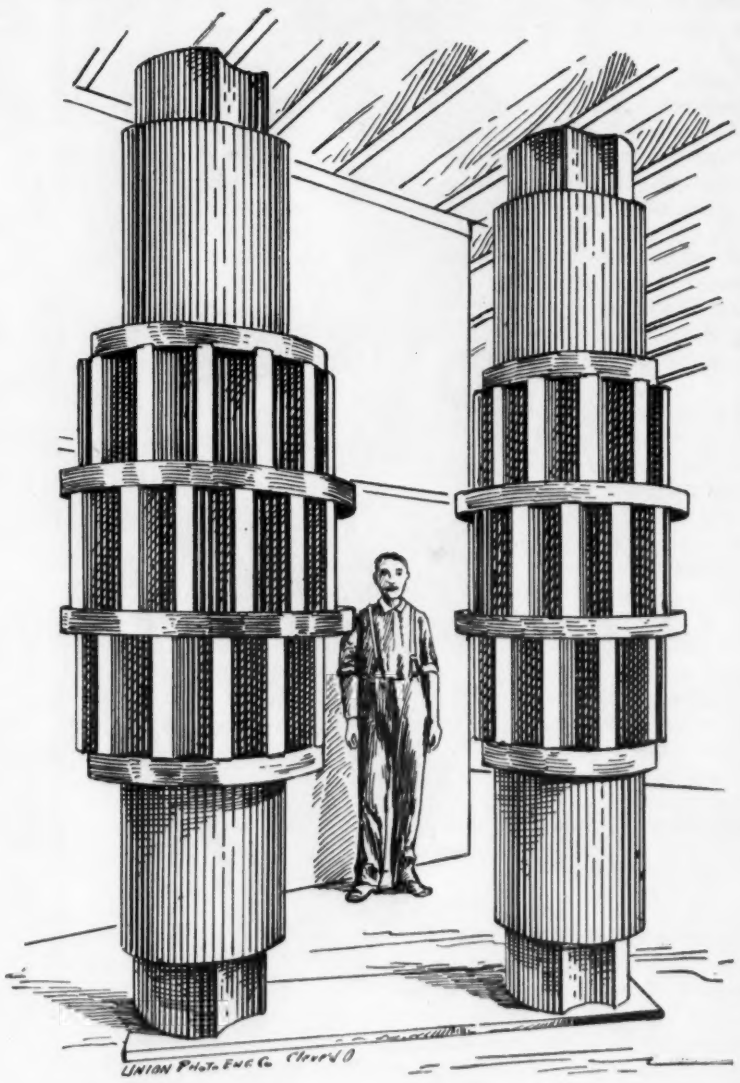
Fig. 3 shows a metallic lath they are manufacturing which is taking the place very largely of the common wood lath. This is claimed to be the best material for walls and ceilings ever put before the public. It is made from the best quality of sheet metal, is thoroughly fireproof and is equally adapted for general use on all classes of buildings. In plastering there is absolutely no waste of material. On ceilings it is not necessary to force the bulk of mortar to the back to procure a clinch. On side walls there is no cutting off and falling of plaster on either side walls of the lath and consequently no filling up of air space between the studding. It is strong and easy to handle and in cutting and fitting there is no waste. It will not sag, it will not buckle

FIG. 2.—CLAPBOARD SIDING.

under heat, and contraction and expansion are absolutely provided for. It is strongly recommended for use with adamant or other fine grained plaster and for this purpose they make the opening somewhat narrower than when common plaster is used. Parties interested in this class of material will do well to correspond with this firm for prices and full particulars. Samples will be mailed upon application.

AN ACHIEVEMENT IN PATTERN-MAKING

We give space for the accompanying reproduction of photograph of patterns for two sheet mill pinions, for two reasons: The pinions are steel, the largest ever made, and they are three-staggered instead of two. They are intended for a plate mill now being built, and their dimensions are as follows: Each is 11 feet over all, one with 15 teeth, $6\frac{7}{16}$ inch pitch and 31 inch pitch



diameter; the other has 12 teeth, $6\frac{7}{8}$ inch pitch and $24\frac{7}{16}$ inch pitch diameter. We hazard the guess that any rolling mill man will look on the cut with interest. It is but fair to say that these patterns were made by a Cleveland firm*, in perhaps the fastest time on record, being finished in six days from receipt of order.

*The Gobeille Pattern Co., Leonard and Winter Sts., Cleveland, O.

A Big Steam-Engine for Tinplate Making.

The members of the American Society of Mechanical Engineers, while attending the recent session of that body at Providence, R. I., visited the Corliss Engine Works, where they were shown a complete steam plant, consisting of a horizontal tandem compound condensing engine, 22 inches and 44 inches diameters of cylinders, 48 inches stroke; fly-wheel, 25 feet diameter; weight, 80,000 pounds; rated at 600 horse-power at 70 revolutions per minute, and three Corliss boilers, to be furnished by the company to the Somerton Tin-Plate Works, of Brooklyn, N. Y., Somers Bros., proprietors.

A MONSTER MACHINE-CUT SPUR GEAR.

The cut of the gear shown herewith represents a very large machine-cut spur gear, made by the Walker Manufacturing Co., of Cleveland, which was used, in connection with a steel pinion made by the same concern, on large pumping engines for removing water from one of the South Africa diamond mines. The dimensions of this gear were as follows: 192 teeth, 30 ft. 6 66″ pitch diameter, 30″ face, 6″ pitch, bore 27″; diameter of hub 9 ft. 2″; weight of hub being 15 tons, and total weight of gear 66¾ tons.

Some conception of the exactness required in the formation of this large wheel may be realized when known that the owners, in order to provide for a possible breakage, which is most improbable, ordered one segment and one arm additional, the requirements of which were that these parts might fill any position in the wheel. The wheel was fitted up most carefully and presents a fine piece of machinery, as may be judged from the illustration.

This gear, with the steel pinion, was the only part of the massive pumping machinery which was made in this country, the balance of work being contracted for in England. In reply to an inquiry as to why the gears had been singled out for manufacture at a different point than the rest of the machinery, the engineer of the company replied that he thought they could rely on getting a superior class of iron in America, and he knew they could secure as perfect work.

A MONSTER MACHINE-CUT SPUR GEAR.

Nickel Steel Manufacture in the United States

The Chicago *Railway Review* states that a Canadian company is now engaged in shipping 240 car loads of nickel matte to the United States from the mines at Sudbury, Ont. The value of the nickel is said to be $1,500,000. "As more than $25,000 will be paid to the Canadian Pacific Railroad as freight the importance of the shipment will be at once appreciated. The nickel is for Carnegie, Phipps & Co., to be used in the manufacture of nickel steel by the Harvey process in their contract with the Government."

NINTH Annual Niagara Falls Excursion via Nickel Plate, August 17th. Enquire of Nickel Plate Agents.

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Manufacturing and Analytical Chemists, W. H. EDGAR, Manager. Office, Room 29, Rialto Building; Works, 4246 Champlain Avenue;
Ohio Office, Canton, O. ROBERT H. CREVOISE. Agent.
WRITE FOR INFORMATION AND PRICES. BEWARE OF INFRINGEMENTS.
CHICAGO, ILL.

THE BASIC STEEL PROCESS.

During the interesting discussion of the Master Mechanics' Convention on "the critical temperature of steel and iron," some of the speakers referred to basic steel in a way which gave the impression that by that process of steel making the product acquired some valuable characteristics not possessed by steel made by the common process. This is a mistake. The aim of those who make steel by the basic process is to produce from inferior ores a metal that is as free from impurities as the steel made by the acid process from irons selected for their purity. In the making of steel by the ordinary Bessemer process, a charge of molten pig iron is put in a pear-shaped vessel called a converter, and through this mass a strong hot blast of atmospheric air is blown which burns the extra carbon and several other impurities out of the pig iron, but leaves the phosphorus and sulphur. As the commoner kind of iron ores contain about two per cent. of phosphorus and 0.2 per cent. of sulphur, and steel for rail making must not have more than 0.06 per cent. of phosphorus and 0.03 per cent. of sulphur, pig iron made from selected ore has to be used for the ordinary Bessemer process of steel making. In this country it has not been difficult to obtain pig iron sufficiently free from phosphorus and sulphur for steel making at a moderate price, but in several of the iron districts of England and Germany, ores suitable for steel making had to be brought from long distances. In order to make use of the inferior ores, a Welsh and a Scotch metallurgical chemist named Thomas and Gilchrist, invented a method by which phosphorus and sulphur can be eliminated from the charge in the converter. The ordinary converter is lined with ganister, a refractory mixture, consisting mostly of silica, which is an acid, like phosphorus and sulphur, and has no affinity for combining with them at high temperatures, as the tendency of elementary substances is for acids to combine with bases—the unlikes mixing together to form new compounds. The invention of Thomas and Gilchrist consisted of lining the converter with a basic mixture, principally dolomite, the elements of which are calcium and magnesium. At the high converter temperature, the phosphorus and sulphur combine with the calcium and magnesium, leaving a metal fairly free from these objectionable hardeners. The process of steel making in this way is not so convenient as that by the so-called acid or ganister lining process, for the converter linings are hard to keep in repair, and there is difficulty in clearing out the hard and tough slag formed by the chemical combinations that have taken place. If selected ores are used to produce Bessemer steel by the acid process that has a certain low percentage of phosphorus and sulphur, there will be no difference in the quality of steel made by the basic process that contains the same percentage of the impurities named.

A modification of this basic system has lately been applied to open-hearth furnaces, a lining of basic material being used on the bed of the furnace. By conducting the open-hearth processes upon such a lining, with the addition at short intervals of a small proportion of lime and iron ore to the charge, a highly phosphoric and basic slag is produced during the working, which, owing to the excess of lime present, removes the silicon completely and the phosphorus almost entirely. If the process is carefully conducted the product is a steel with very little phosphorus in it. The best open-hearth steel produced by the basic process is, however, no better nor less free from phosphorus and sulphur than the Otis or Shoenberger steel, which is made by the acid process from carefully selected iron.—[National Car and Locomotive Builder.

The Influence of Heat on the Strength of Iron.

Professor Martens, Berlin, has published in the *Mittheilungen aus den koniglichen technischen Versuchanstalten zu Berlin* a report of some ezperiments on the strength of steel at various temperatures between 20° and 600° C. The material used consisted of mild steel, having a tensile strength of 23 tons, 27 tons, and 30 tons per square inch, respectively. The bars from which the test pieces were cut were 1½ inch in diameter and were thoroughly annealed. A number of bars of the same quality of metal were all tested in the usual way, both after annealing and as received from the makers, so as to form a standard of comparison for the other bars. The temperature of the bars was obtained by placing them in a bath and testing them there. For the low temperature tests the bath was filled with a freezing mixture, and for the high temperature tests, with paraffine, up to 200° C. beyond which alloys of lead and tin were used. The contents of the bath were warmed by gas jets, and stirred during the course of the experiments. The elongations of the bar up to the yielding point were taken on the length of 8-1 inches, by means of a mirror apparatus, the diameter of the tested portion being 0-79 inch, and autographic diagrams were also taken of each specimen. The results of the experiments showed that the elastic limit of the material became lower as the temperature rose, though the falling off was not very serious up to 200° C., but beyond that point it lowers somewhat rapidly, and finally seems to disappear. The maximum stress decreases from 20° C. up to 50° C, but afterwards rapidly rises to a maximum somewhere between 200° C. and 250° C. Taking the strength of the specimen at 20° C., the maximum stress for the 23-ton steel is 1 34 greater, and the maximum breaking stress is 1 62. For the 27-ton steel the figures are 1.27 and 1 45, and for the 30-ton steel 1 25 and 1.50. The contraction of area for all the specimens was at least about 300° C.

McKINLEY PRICES OF MANUFACTURES.

Evidently the tendency of prices has proved disappointing for the political prophets who less than a year since filled the country with their cries of higher prices. Erstwhile blatant heralds of "McKinley prices" now roar as gently as any sucking doves, while thoughtful voters are given time for comparison of last year's price lists with those of today.

If voters who were stampeded a year ago and temporarily corraled in the free trade fold now seek to discover what frightened them, they will be forced to the conclusion that only blank cartridges were fired, and that after all nobody was hurt by the explosion.

The tariff on wools was slightly increased, and corresponding advancement made on some lines of woolen fabrics; but the fact remains that the family man now buys both clothing and carpets as cheaply as ever before. A few cents was also added to the charge against foreign manufacturers for selling certain lines of cutlery; but a good pocket knife can still be had for its last year's price, while table cutlery and mechanical tools were never so cheap as in this year of grace and McKinley prices. Twenty-five dollars per ton additional tariff was demanded from the tinplate autocrats of Great Britain; but even if this could be distributed among retail purchasers of tin wares, it would not figure above one-third of a cent on a pint cup, and not over two or three cents on a milk pan or a dinner pail. Consequently, the jobber pockets the slight difference in first cost and begs his customers to continue buying at former prices.

It is right here in this tin business that a surprise lies in store for those who are led to believe that no progress is being made toward tinplate manufacture in this country. Reckless men may deny it, and foolish men may believe their assertions, but the fact remains that already considerable quantity of home-made tinplates are being turned out, and that additional plants are being perfected as rapidly as the amount and magnitude of necessary machinery will permit. Those who deem it advisable to sneer at the incipiency of preparations in this direction carefully omit mention of the fact that the tin clause in the present law did not take effect until July 1, 1891.

Neither are tariff reformers just now talking about sugar in very loud tones. Although the sugar clause did not take effect until April, retail prices of that universal household necessity have completely discredited predictions that free sugar would benefit nobody outside the ring of those refiners who so long dominated the market. But this significant silence as to sugar should not be permitted to conceal the fact that every demand for repeal of the McKinley law is a demand for restoring duties, which would amount to more than double all the increase provided for in that measure.—[A. M. Garland, Secretary, Illinois Branch American Protective Tariff League.

Big Electric Welding Plant.

The big welding plant at the works of the Johnson Co., Johnstown, Pa., is being enlarged. A year ago last April one machine was installed, which was a combination bar splicer and used for joining rails on switches and crossings. Last Fall two more machines were put in, one of which was for large welds of four-inch sections on various articles; the other machine was for welding rails in crossing at various angles. This latter machine will make a weld eight inches in diameter, while the other will make a weld four inches. The company will put up a power house and equip it with five 100 horse-power and two 150 horse-power Ball engines. A special boiler house will be erected. All the electrical apparatus used will be of the Thomson type.—[Western Electrician.

Curiosities of Iron.

Add carbon to pure iron and it becomes steel. Add a hydrocarbon to iron and steel itself becomes so extensively modified that its properties are not recognizable. Thus steel may be as soft as pure iron. Add hydrogen, in varying quantity, and it has the quality of resilience, as in the watch spring, or in the quality of tenacity, as in the knife or razor, or may be given nearly the hardness of a diamond, as in a file. With steel at a low temperature, from 405° to 450° Fahr., edge tools are produced, the color in the yellow shades; from 500° to 525° various sorts of springs are produced, color blue; while by heating iron to whiteness and plunging it into water, which is mainly composed of hydrogen, files are produced or forms even harder.—[Journal of Useful Inventions.

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INDUSTRIAL SUMMARY.

New Enterprises.—

The Jones Foundry Co. has been organized at Columbus, O., with a capital of $30,000.

The building of Walker's new foundry and machine shop at Oxford, N. Y., is well under way.

The Maist & Gorten Machinery Manufacturing Co. have been incorporated at Warsaw, Ind., with a capital of $25,000.

It is possible that a new tinplate works will be erected at Blairsville, Pa., very soon, by Mr. Paul Graff and D. M. Fair, of that place.

A Pittsburgh exchange says that the Falcon Iron & Nail Co., of Niles, O., is the latest firm that has decided to embark in the tinplate business.

Pueblo, Col., expects to secure the location of the Pullman Steel Car Works. This will be a gigantic industry employing a force of 1,200 men.

The capital stock of the Excelsior Heater & Manufacturing Co. of Chicago, is $150,000, and the incorporators are A. R. Gray, H. W. Walker and S. E. Hibben.

The Kennedy Valve Manufacturing Co., capitalized at $150,000, have been incorporated at Albany, N. Y., to manufacture valves and hydrants, special and all kinds of machinery.

A Pennsylvania company has leased and will operate as electrical works the Gephart foundry and machine shops at Cumberland, Md.; will be known as the Cumberland Electrical Co.

A charter has been issued to the Sterrett Foundry Co., of Pittsburgh. The capital stock is $6,800; Directors, Wm. B. Sterrett, Wm. J. Sterrett, Wm. E. McMurray and Wm. S. Paisley.

Ashworth Bros., of Manchester, England, are erecting a machine shop at Fall River, Mass. They have recently purchased additional land, with a view to increasing the plant as occasion demands.

J. D. Dougherty, boiler maker, Dayton, O., has been succeeded by the Miami Boiler Manufacturing Co. The latter have incorporated with $25,000 capital and made improvements to the plant.

The De Soto Machine Co., with a capital stock of $9,000, has been incorporated at De Soto, Mo., to do a general machine business, and the incorporators are Nicholas O'Brien, John Pickels and John H. Williams.

The Waukegan Iron & Steel Castings Co. has been incorporated at Waukegan, Ill., to manufacture iron and steel castings. The incorporators are E. L. Lamb, E. P. Upham and A. G. Clark, and the capital stock is $50,000.

J. T. Ambrose, H. T. Cooper and others have recently incorporated the Cedar Mountain Iron & Steel Co., at Knoxville, Tenn., for the purpose of erecting iron and steel plant. J. T. Ambrose is manager; capital stock, $200,000.

The American Metallic Steam Packing Co. have filed articles of incorporation at Camden, N. J. The capital stock of the company is $200,000, and their object the manufacture of metallic steam packing for stationary engines, locomotives, etc.

The Non Exhausting Engine Co. is a new incorporation at East St. Louis, Ill., to manufacture steam engines. The capital stock has been placed at $1,000,000, and the incorporators are E. O. Bartholomew, C. O. Williams, C. B. Wickes, A. H. Schott and E. R. Paillon.

The Rail Lock Joint Co., of Poughkeepsie, N. Y., recently formed and controlled by men prominent in railroad circles, has elected Thomas J. Swift, of Poughkeepsie, President. Mr. Swift is the owner of one third of the capital stock of the company, which is $250,000.

The Cedar Mountain Steel Co. was recently organized at Knoxville, Tenn. The company has bought 20 acres of brown hematite iron ore on the Doe river, five miles above Elizabethton, and will immediately put up a 30-ton blast furnace to make steel ingots by the Canby direct process.

The Cartwright Patent Steel Hand Car Works, also manufacturers of steam pumping machinery and engines, has just been reorganized as the Benton Harbor Iron Works, and have chosen a site at Benton Harbor, Mich., for the erection of very extensive brick factory buildings for their works.

John S. Cleland, W. J. Kiskaddin and others of Pittsburgh have made application for a charter for an intended corporation, to be known as the National Separating & Manufacturing Co., of Pittsburgh, the character and object of which is the manufacture of iron and steel and other metals.

A new linen machinery company has filed articles of incorporation in Minneapolis, Minn., under the name of the Linen Machinery Co. The capital stock is $20,000. The incorporators are C. A. Pillsbury, F. G. Winston, V. W. Bayless, C. Travis, Charles R. Chute, A. C. Bruce, C. Wright Davison and J. C. Allen.

Additions, Enlargements, Removals, etc.:—

Some extensive additions are being made to the Moline (Ill.) Plow Co.'s plant, including a cupola of the Colliau pattern, two Corliss engines of 150 and 100 horse-power.

The C. B. Rogers Co. are adding an extensive wing to their machine shops in Norwich, Conn.

The Delaware & Hudson Canal Co. is to improve the facilities of its repair shop at Whitehall, N. Y.

The Whitman & Barnes Co. are contemplating extensive improvements in their works at Canton, O.

At Clarksburg, W Va., A. H Osburn will rebuild at once his foundry and machine shops, recently destroyed by fire.

The Brownell Engine & Boiler Works, of Dayton, O., is investigating with the view of establishing a branch of its works in Chattanooga, Tenn.

The Linwood Iron Works Co., Linwood, Pa., will shortly build a new machine shop and foundry of double the capacity of the present plant.

The Knowles Steam Pump Co., at Warren, Mass., are building a new boiler house, and work will soon begin on a 40x75-foot extension to the iron foundry.

The Hopedale Machine Co., Hopedale, Mass., are enlarging their works by the erection of two three story buildings, one of brick, 80x50 feet, and the other of wood, 100x160 feet.

The works of the Chicago Axe Co., at Hammond, Ind., have been bought by Peoria (Ill.) capitalists. The purchasers, it is said, will spend $100,000 in enlarging the plant and employ 600 men.

The Valley Iron Works, of Williamsport, Pa., is about to remove its entire plant to Lynchburgh, Va., where it is erecting extensive works. Hereafter it will be known as the Valley Engine & Machine Co.

The Lansberg Brake Co, of St. Louis, Mo., will add an additional story to its shop and put in $15,000 worth of new machinery. The company is now said to be turning out brakes at the rate of 150 a month.

The Middleton Car Spring Co., of Philadelphia, Pa., has decided to remove its works to Harvey, Ill., a short distance from Chicago. This action was taken in order to get nearer the market, and also the supply of some of the materials used.

Jones Scale Works, at Binghamton, N. Y., are being enlarged by the addition of another story to the main building, and the building of a foundry 160 x60 feet, a forge shop 60x40 feet, a boiler room 60x50 feet and a storehouse 75 x60 feet.

The Grand River File Co, Grand River, O, successors to the Hubbard & Haskell File Co., of Erie, Pa., are making considerable additions to their plant. this being made absolutely necessary by the largely increased demand for their product.

The Howe Ventilating Stove Co., of Cortland, N. Y., will erect stove works in Tallapoosa, Ga. The plant will consist of two main buildings 60x250 feet in size, molding-room, polishing-room, etc. A nickel plating plant will be operated in connection.

General Manager Joseph Ramsey, Jr., of the Big Four Lines, states that orders have been given to at once proceed with the erection of the division shops at Bellefontaine, O. In addition to the $100,000 bonus which the city gives the company, the latter will add $50,000 more to make it of the capacity desired.

The Joliet Enterprise Co., of Joliet, Ill., whose wire drawing and barb wire works were destroyed by fire a short time since, have decided to rebuild in South Joliet. They propose to erect a rod mill as well as a wire drawing plant and a barb wire factory. It is reported that they have already ordered a 1,200 horse-power engine for the rod mill.

Ashland has nailed another manufacturing plant, says the Ashland (Wis.) *Press*. It is a steel and nail works with a capacity of 150 kegs a day, to be manufactured out of Ashland iron. For some time past the Business Men's Association has been corresponding with an extensive nail works concern in Ohio, to come to Ashland. The manager of the works has made a thorough investigation, and is satisfied the plant would pay better here, considering the shipping facilities and the fact that they are close to the Western market. The Ohio concern has 30 of the latest improved nail machines which have been in use less than a year. The plant would start in with 25 to 50 skilled workmen and manufacture cut steel nails, finishing, box, barrel, chuck, fine blued and polished nails. The total annual output of the plant will exceed 5,000 kegs.

General Industrial Notes:—

Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M., on the 20th day of August, for all the labor and materials required for furnishing and putting in place complete, the low-pressure, return-circulation, steam heating and ventilating apparatus, for the United States post office building, at Bridgeport, Conn.

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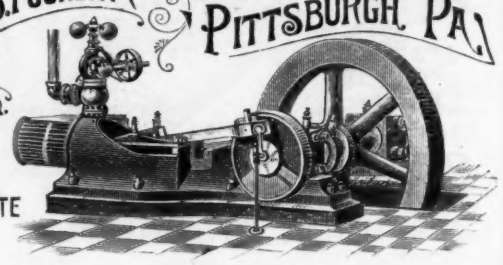

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The Totten & Hogg Iron & Steel Foundry Co., of Pittsburgh, Pa., have just closed a contract with the James Smart Manufacturing Co., of Brockville, Ontario, Can., for special train of rolls, complete, for cold rolling and finishing steel, for a special purpose. They are also busy with a large order of gas and air valves, for regenerative gas furnaces, both the plain and the Higgs patent water valves.

We have received a copy of the latest edition of the catalogue of the New York Central Iron Works Co., of Geneva, N. Y., manufacturers of the famous Dunning boiler and other specialties. They have been making these boilers for more than 20 years, and have placed them in nearly every town and village in the United States, and have acquired a reputation for them for efficiency and durability that is not equaled by any other boiler in the country. Write for particulars.

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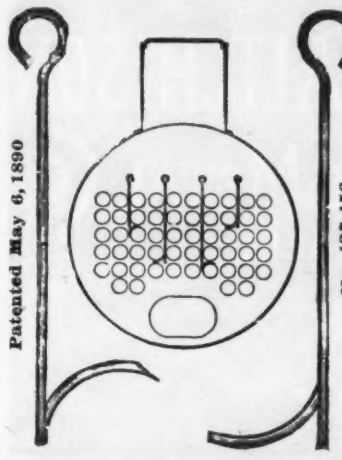
The Petroleum Industry.

There are 46,000 oil wells in the United States, representing a capital of $120,000,000, with an output of 130,000 barrels per day. The refining capacity of the country, is 140,000 barrels per day; while 15,000 barrels are consumed as fuel. A surplus stock is held in tanks of more than 35,000,000 barrels.

TEXAS has decided to set apart a spacious room in its building at the Columbian Exposition for an exhibit by the colored people of the State.



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ARTHUR B. FOSTER, GENL. MANAGER.

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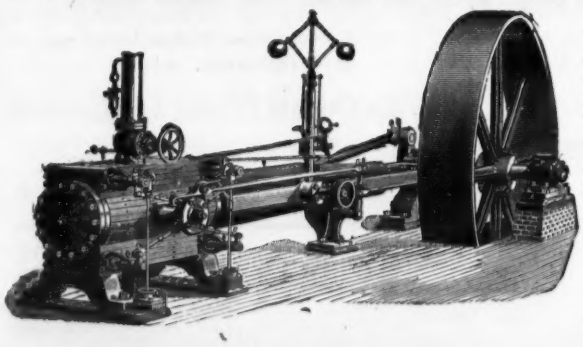

Iron and Wood Working Machinery of every description; Corliss Engines and Boilers; Shafting, Pulleys and Hangers.
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120 BROADWAY, N. Y.

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PERFORATING CO.

MANUFACTURERS OF PERFORATED METALS FOR
SUGAR HOUSES,
DISTILLERIES,
PHOSPHATES AND FERTILIZING WORKS.
COTTON SEED OIL MILLS.
RICE MILLS.
PERFORATED METALS
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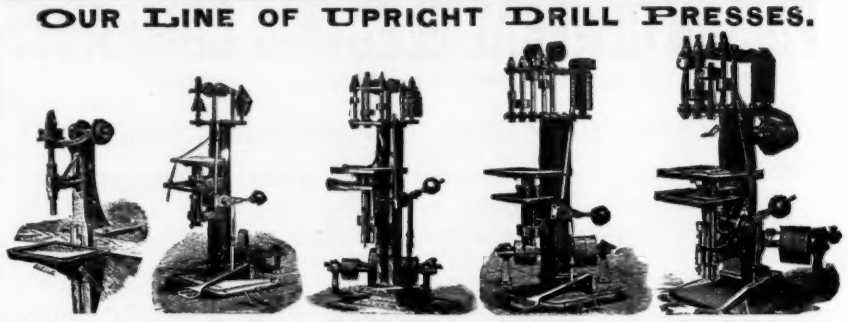

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Manufacturers of, and Dealers in, all kinds of
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Universal and Plain Milling Machines, Drill Presses, Screw Machines, Hand and Engine Lathes, Planers, Profilers, Chucking Machines, Gear Cutters, Die and Cutter Grinders, Tapping Machines, Wire-Spring Coilers, Milling Cutters, etc.

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GEAR CUTTING AND MILLING IN ALL ITS BRANCHES.
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COPELAND & BACON.
HOISTING & WINDING ENGINES
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The cheapest made. Send for prices
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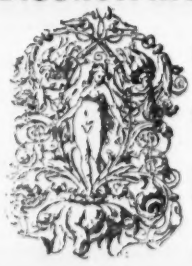

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Magnetic Concentration of Iron Ore.

Ball-Norton (Monarch) Electro Magnetic Separator.

Phosphorus, sulphur, silica, hornblende and other impurities eliminated from Iron Ore, and non-Bessemer ore converted into Bessemer Ore. Samples treated without charge. Correspondence solicited.

H. E. COLLINS & CO., Agents Magnetic Separator Co.,

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CLEVELAND ROLLING MILL CO.,

MANUFACTURERS OF

BESSEMER STEEL RAILS,

Blooms and Billets, Steel Angles, Forgings, Bar and Spring Steel. Steel Street Rails, Steel Oil Barrel Hoops, Wire of all Kinds, Iron and Steel Boiler Plates, Galvanized and Black Sheet Iron, Corrugated Iron Roofing, Sheet Steel.

IRON AND STEEL MARKETS.

PIG IRON.

CLEVELAND (f. o. b. cars, net cash) Bessemer, $17 30; No. 1 Foundry, $16 80; No. 2 Foundry, $15 80; No. 1 Gray Forge, red short, $14 80; No. 2 Gray Forge, neutral, $14 30; No. 1 American Scotch, $16 80; No. 2 American Scotch, $15 80.

CHICAGO (reported by Messrs. Rogers, Brown & Merwin): Southern Coke No. 1 foundry, $16 25@17 00; Southern Coke No. 2 Foundry, $15 25@16 00; Southern Coke No. 3 Foundry, $14 75@15 00; Southern Coke No 1, Softeners, $15 25@16 00; Southern Coke No. 2, Softeners, $14 50@15 25; Ohio Silveries No. 1, $17 50@18 50; Ohio Silveries No. 2, $16 50@ 17 50; Ohio Strong Softeners No. 1, $18 00@19 00; Ohio Strong Softeners No. 2, $17 25@18 25; Lake Superior Charcoal Nos. 1 to 6, $17 75@18 50; Tennessee Charcoal No. 1, $18 00@19 00; Tennessee Charcoal No. 2, $17 00@18 00; Southern Standard Car Wheel, $21 00@23 00; Tennessee Standard Car Wheel, $00 00@00 00

CINCINNATI (reported by Rogers, Brown & Co.): FOUNDRY IRONS—Southern Coke, No. 1 foundry, $15 00@15 25; Southern coke, No. 2 and No. 1 soft, $13 75@14 00; Hanging Rock Coke No. 1 foundry, $16 50@17 50; Jackson Co. Stone Coal, No. 1 foundry, $16 50@17 00; Tennessee Charcoal, No. 1 foundry, $16 50@17 50; Hanging Rock Charcoal, No. 1 foundry, $20 00@22 00. MILL IRONS—Standard Southern Coke, grey forge, $12 75@13 00; Standard Southern Coke, mottled, $12 25@12 50; Cold Short Southern Coke, grey forge, $12 75@13 00; Strong Ohio Neutral Coke, grey forge, $15 00@15 50. CAR WHEEL AND MALLEABLE—Standard Alabama Car Wheel, $19 50@20 50; Tennessee Car Wheel, $18 00@19 00; Lake Superior Car Wheel, $19 00@20 50.

BUFFALO (reported by Rogers, Brown & Co): Mahoning and Shenango Valley strong, No. 1 Foundry, $16 50@00 00; Mahoning and Shenango Valley strong, No. 2 Foundry, $15 50@00 00; Ohio Softener No. 1, $16 50@00 00; Ohio softener No. 2, $15 50@00 00; Jackson Co., Silvery No 1, $17 80@00 00; Jackson Co. Silvery, No. 2, $16 80@00 00; Lake Superior Charcoal, $18 00@00 00; Tennessee Charcoal, $17 50@19 00; Southern Softener No. 1, $15 75@16 00; Southern Softener No. 2, $15 00@00 00; Southern Strong No. 1 Foundry, $16 50@16 75; Southern Strong No. 2 Foundry, $15 75@16 00; Alabama Car Wheel, $22 00@22 50; Hanging Rock Charcoal, $23 00@24 00.

LOUISVILLE (reported by Hall Bros. & Co.) HOT BLAST FOUNDRY—Southern coke No. 1 $ 4 25@14 50; Southern coke No. 2, $13 50@14 00; Southern coke No. 3, $13 00@13 25; Mahoning Valley (Lake ore mixtures), $00 00@00 00; Southern charcoal, No. 1, $16 00@17 00; Southern charcoal, No. 2, $15 50@16 00; Missouri charcoal, No. 1, $17 00@17 50; Missouri charcoal, No. 2, $16 50@17 00. FORGE—Neutral coke, $12 50@12 75; Cold short, $12 25@12 50; Mottled, $11 75@12 00 CAR WHEEL AND MALLEABLE—Southern (standard brands), $19 00@19 50; Southern (other brands), $17 00@18 00; Lake Superior, $20 00@21 00.

ST. LOUIS (reported by Rogers, Brown & Meacham): HOT BLAST COKE AND CHARCOAL—Southern Coke No. 1, $15 50@15 75; Southern Coke No. 2, $14 50@14 75; Southern Coke No. 3, $ 3 75@14 00; Southern Grey Forge, $13 25@13 50; Southern Charcoal No. 1, $17 25@17 75; Southern Charcoal No. 2, $16 75@1 25; Missouri Charcoal No. 1, $15 50@16 00; Missouri Charcoal No. 2, $15 00@15 50; Ohio Softeners, $18 00@19 00. CAR WHEEL AND MALLEABLE IRONS—Lake Superior, $19 50@20 00; Southern, $19 50@2 00. CONNELLSVILLE COKE—East St. Louis, $0 00 St. Louis, $5 65

DETROIT (reported by William F. Jarvis & Co.): Lake Superior Charcoal, all Numbers, $18 00@18 50; Lake Superior (coke) Bessemer, $ 7 75@18 25; Katahdin (Maine charcoal), $00 00@00 00; Lake Superior Coke, Foundry, all ore, $17 50@18 00; Lake Superior Coke, Foundry, all ore, $00 00@00 00; Standard Ohio Black Band, $18 00@18 25; Southern No. 1 $16 25@16 50; Southern Gray Forge, $14 00@14 50. Jackson County (Ohio) Silvery, $18 00@ 8 50 Old Car Wheel, $00 00@00 00. Connellsville Coke, $0 00.

LOUISVILLE (reported by Geo. H. Hull & Co.): Southern Coke No. 1 Foundry $14 50@15 00 Southern Coke No. 2 Foundry $13 75@14 25; Southern Coke No. 3 Foundry $13 25@13 75; Grey Forge, $12 75@13 25; Southern Coke Silver Grey, $00 00@00 00; Southern Charcoal No. 1 Foundry, $16 00@17 00; Car Wheel, $19 00@20 00.

PITTSBURGH (reported by A. H. Childs): No. 1 Foundry, $16 25@16 50; No. 2 Foundry, $15 25@15 50; Grey Forge, $14 00@14 25; White and Mottled, $13 25@13 50; Warm Blast Charcoal, $18 00@22 00; Cold Blast Charcoal, $22 00@26 00; Bessemer, $16 25@16 50.

MERCHANT IRON AND STEEL.

Flat Bar

1½ to 4 by ⅜ to 1 inch	1 80
4½ to 6 by ⅜ to 1 inch	1 90
1½ to 6 by 1¼ to 2 inch	2 20
1¼ & 1½ by ¼ to ½ inch	1 90
1 & 1¼ by ⅜ to ½ inch	2 00
⅛, ¼ and ⅜ by ⅜ to ½ inch	2 20

Round and Square.

1 to 1⅜ inch	1 80
2 to 2¾ inch	2 00
2¾ to 3¼ inch	2 30
3¾ to 4 inch	2 80
4¼ to 4¾ inch	3 30
4¾ to 5 inch	3 50

Oval.

¼ to 1¼ inch	2 20
⅜ to ¾ inch	2 40
⅞	2 60
½	3 00

Half Oval and Half Round.

1⅜ to 3 inch	2 90
⅜ to 1¼ inch	2 50
½ to ¾ inch	3 10
⅝	3 30
¾	4 80

Heavy Band.

¼ to 6 by ¼ and 5-16 inch	2 00
¼ to 1⅜ by ¼ and 5-16 inch	2 10
⅝ to ⅞ by ¼ and 5-16 inch	2 30
[illegible]	3 80

Hoops.

1¼ to 4, Nos. 13 to 15	2 60
1¼ to 2, Nos. 16 to 18	2 70
1¼ to 2, No. 19	2 80
1¼ to 2, No. 20	2 90
1¼ to 2, No. 21	3 00
1¼ to 2, No. 22	3 10
15-16, 1 and 1⅛, Nos. 13 to 15	2 80
15-16, 1 and 1⅛, Nos. 16 to 18	2 90
15-16, 1 and 1⅛, Nos. 19 and 20	3 00
15-16, 1 and 1⅛, No. 21	3 10
15-16, 1 and 1⅛, No. 22	3 20
⅞, Nos. 13 to 15	3 00
⅞, Nos. 16 to 18	3 10
⅞, Nos. 19 and 20	3 20
⅞, No. 21	3 30
⅞, No. 22	3 40
13-16, Nos. 13 to 15	3 20
13-16, Nos. 16 to 18	3 30
13-16, Nos. 19 and 20	3 40
13-16, No. 21	3 50
13-16, No. 22	3 60
¾, Nos. 13 to 15	3 30
¾, Nos. 16 to 18	3 50
¾, Nos. 19 and 20	3 70
¾, No. 21	3 70
¾, No. 22	3 80
11-16, Nos. 13 to 15	3 50
11-16, Nos. 16 to 18	3 70
11-16, Nos. 19 and 20	3 80
11-16, No. 21	3 90
11-16, No. 22	4 00
⅝, Nos. 13 to 15	3 70
⅝, Nos. 16 to 18	4 00
⅝, Nos. 19 and 20	4 10
⅝, No. 21	4 20
⅝, No. 22	4 30
⅝, No. 23	4 50

Light Band.

1⅛ to 6 by ⅛ to 3-16 in	2 20
1⅛ to 6 by Nos. 11 and 12	2 30
1 to 1¾ by ⅛ to 3-16 in	2 40
1 to 1¾ by Nos. 11 and 12	2 50
⅛ and 13-16 by ⅛ to 3-16 in	2 70
⅛ and 13-16 by Nos. 11 and 12	2 80
¼ and 11-16 by ⅛ to 3-16 in	3 00
¼ and 11-16 by Nos. 11 and 12	3 10
¼ and 9-16 by ⅛ to 3-16 in	3 30
¼ and 9-16 by Nos. 11 and 12	3 40
⅜ by ⅛ to 3-16 in	3 60
⅜ by Nos. 11 and 12	3 70

Wagon Box Iron.

⅛ inch, beveled edge, by Nos. 11 and 12	2 80
⅛ inch, " " " 13 and 14	3 00
¼ inch, " " " 11 and 12	3 10
¼ inch, " " " 13 and 14	3 30

Sheet Iron.

No. 10 to 14	2 65
No. 15 to 17	2 75
No. 18 to 21	2 99
No. 22 to 24	3 15
No. 25 to 26	3 30
No. 27	3 40
No. 28	3 50

Iron Boiler Plates.

Tank, ¼ inch and heavier	2 60
C No. 1, " "	2 85
C H No. 1 " "	3 10
C H Flange, " "	3 85
Extra Flange, "	4 35
Solid Fire Box "	5 10

Steel Boiler Plates—1-4 in. and Heavier.

Tank	2 75
Shell	3 15
Flange	3 45
Marine Flange	3 85
Fire Box	4 55

Above includes plates 90 inches wide.

90 to 96 in. wide	¼c ℔ extra
96 to 100 in. wide	1 c "
100 to 104 in. wide	1¼c "
104 to 116 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. ℔s
1 to 2 in. inclusive	09
9-16 to ⅞ in "	09
7-16 to ⅞ and 2¾ to 3 in	10½
3⅛ to 4 in	11
⅞ to 11-16 and 4¼	10½
⅞ to 6 in	11½
¼ to 9-32 and 6¼ to 7 in	12
3-6 in	14

Flats.

	cts. ℔s
2 to 9-16 wide by 2 to ⅝ thick	9

Bessemer and O. H. Steel.

Machinery	base price, 2 75
Tire	" 2 75
Spring	" 3 25
Sleigh Shoe	" 2 75
Toe Calk	" 3 00
Cutter Shoes, tapered and burr.	" 3 00

English Tool Steel.

Jessop's	16c
Hobson's "Best"	16c
" "Choice"	36c

Burden Boiler Rivets.

⅛, ⅝, 11-16 and ¾ inches diameter	4 00
Bridge ¾, ⅞, 11-16 and ¾ inch diam	4 00

SCRAP IRON AND OLD METAL.

NET TONS	
No. 1 R. R. wrought scrap	$18 00
No. 1 wrought scrap	16 50
No. 1 Machine cast scrap	11 50
Iron axles	23 50
Axle turnings	13 50
Wrought turning (free from cast)	11 50
Cast borings	8 00
Uncut wrought iron boilers	11 50
Steel boiler plates	16 00
Grate Bars	8 00
Pipes and flues (Clean)	12 00
Tank iron	12 50
Hoop and band iron	9 50
Sheet iron	8 50
Wrought drillings	11 00
Malleable iron	9 50

Reported by Messrs. BLACK & POLLOCK, Cincinnati, O.:

Railroad Wrought	$20 00
No. 1 Country Wrought	17 00
Stove Plate	8 75
Machine Castings	11 00
Hoop and Sheet	8 00
Casting Borings	9 00
Wrought Turnings	10 00

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CAMBRIDGE REFINED IRON. TRADE MARK

Squared Roofing Sheets a Specialty.

CAPACITY RANGES FROM No 30 26 INCHES WIDE TO 1-4×40×120

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1 $250 BOND - First-Class Security.

Bearing 8 per cent., payable semi-annually.

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FOR SALE---BLOWING ENGINE.

Vertical pattern, with balanced steam slide valve gear, steam cylinder 14-in. diameter, air cylinder 40 in. diameter, stroke 24 in., 1 to 190 strokes per minute; engine new. For price and particulars address THE JAMES LEFFEL & CO., Springfield, O.

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Rooms 716, 717, 718, 719 Perry-Payne Bld'g.

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Successors to Tuttle, Oglebay & Co.,

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FROM MARQUETTE, GOGEBIC AND MENOMINEE DISTRICTS,

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Cleveland Iron Mining Co.,

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MINERS AND SHIPPERS OF

Ohio Steam Coal and Coke.

Mines on the Cleveland, Lorain & Wheeling R. R. Capacity, 3,000 tons daily.

Office, 6 Mercantile Bank Building,

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JAS. PATTERSON, Sales Agent.

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MAKERS OF

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Cleveland, O., U. S. A.

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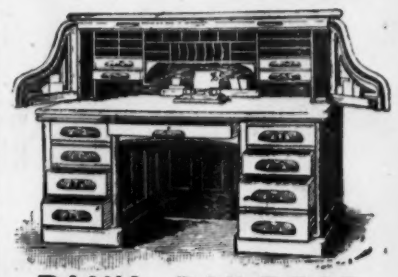

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Interior Work a Specialty.
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97-99 Ontario St., - - Cleveland, Ohio.

MACHINERY SUPPLY MARKET.

Anvils.

American.....₩ lb 9@10
Wrights.....₩ lb 12

Bellows.

Blacksmiths' { Hill's.....dis 40 / Bullock's.....dis 50&10
Moulders'.....dis 40@40&10
Hand.....dis 40&10@50

Belting.

Boston Belting Co's standard.....dis 70
" " " extra.....dis 60&5
" " " best.....dis 55
Hoyt's Short Lap.....dis 45
Cleveland Rubber Co. extra standard..dis 60&10
Shults Raw Hide Leather Belting, single.....dis 40
Shults Raw Hide Leather Belting, double, and Light Double.....dis 40
Standard, oak tanned.....dis 50&10
Alexander Brothers' pure oak tanned.....dis 45

Blowers and Exhausters.

B. F. Sturtevant's.....dis 20
Boston Blower Co.,.....dis 35
Buffalo.....dis 35

Borax.

.....₩ lb 12

Chalk.

White.....₩ gross 30
White Crayon.....₩ gross 12@12½ dis 10
Red.....dis 70
Blue.....dis 65

Chucks.

Cushman's 4 Jaw Independent.....dis 45
" Combination.....dis 40
" Geared Scroll.....dis 30
" 2 Jaw Brass Workers.....dis 30
" Drill.....dis 35
Wescott's Scroll Combination.....dis 33⅓
" Independent.....dis 40
" Little Giant Drill.....dis 30
Horton's Universal.....dis 40
" Independent.....dis 45
Whiton's Independent.....dis 45
National Combination.....dis 40
Sweetland " .....dis 40
Almond Drill.....dis 20
Morse " .....dis 15
Skinner's Combination Lathe.....dis 33⅓
" Independent Lathe.....dis 40
" Universal Lathe.....dis 40
" Drill.....dis 15

Cutters and Reamers.

Cleveland.....dis 10@15
Pratt & Whitney.....dis 10@15
Standard.....dis 10@15
Brown & Sharpe, Milling Cutters.....dis 15
" Gear Cutters.....dis 15

Crowbars.

Cast Steel.....₩ lb 4
Iron, steel points.....₩ lb 3½

Drill and Drill Sockets.

Twist drills.....dis 50&10
Morse Taper and Straight shank to 1¾".....dis 50&10
Morse Taper and Straight shank Larger than 1¾".....dis 25
Drill Sockets.....dis 25
Standard Twist Drills.....dis 55@55&5
Cleveland " " .....dis 55@55&5

Emery.

	No. 4 to 46 gr.	No. 54 to 150. gr.	Flour, F.	C. F. FF.
Kegs, ₩ lb	4 c	5 c		2¾c
½ kegs ₩ lb	4¼c	5¼c		2¾c
¼ kegs ₩ lb	4¾c	5¾c		3 c
10 lb cans, 10 in case	6 c	6¾c		5 c
10 lb cans, less than 1	10 c	10 c		7¾c

Emery Cloth and Paper.

Barder, Adamson & Co.....dis 45@50
H. H. Barton.....dis 50@50&10

Emery Wheels.

Detroit.....dis 55@60
Norton's.....dis 55@60
Grant.....dis 55@60
Sterling.....dis 60
Celluloid.....dis 10&33⅓
Northampton.....dis 55
Crystal.....dis 65@70
Vitrified.....dis 60
Vulcanite.....dis 10&10

Files.

Nicholson.....dis 60&10@60&10&10
" X. F.....dis 25
Kearney & Foot.....dis 60&10@60&10&10
Black Diamond.....dis 60&10@60&10&10
Arcade.....dis 60&10@60&10&10
Disston's.....dis 65@70
Western.....dis 70
Stub's.....dis 25
Grobet's.....dis 30
Reynolds Bros.' Hand Cut.....dis 50
ndustry File Works, hand cut.....dis 50

Hammers.

P. S. W.....dis 40
Atha new list, Jan. 15, 1887.....dis 50
Heavy hammers and sledges under 5 lbs. 18c over 5 lbs 14c, new list.

Jack Screws.

Illinois Bolt Co. list.....dis 70

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4½	4	3½	2¾
Hexagon	13½	11½	8½	6	5½	5	5
Washers	9	8	7	5	4½	4¼	4¼

In lots less than 100 lbs, ₩ lb add ½c., 1lb boxes add 1c to list.

Nails (wire.

List July 14, 1887.....dis 70 &10
Standard Penny Nails, ₩ keg card rate { Car lots.....$2.30 / Less than car lots $2.40

Oilers.

Zinc and Tin.....dis 60
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $5.60; No. 2, $4.00; No. 3, $4.40 ₩ doz.....dis 10@10&10

Packing, Steam.

Boston Belting Co.....dis 60
American Packing Hemp.....₩ lb 10@11
Russia Packing " .....₩ lb 14
Italian Packing " .....₩ lb 13@14
Plumbago Piston.....₩ lb 40
Morrison's " .....₩ lb 50
Square Flax " .....₩ lb 50
Sheet Rubber.....₩ lb 12&24
Excelsior Rubber.....₩ lb 48

Picks.

Railroads, 5 to 6 lbs.....$12 dis 60
" 6 to 7 lbs.....$13 dis 60

Pulleys.

Iron Pulleys, Walker List.....dis 45
Medart Pulleys.....dis 55
Split Wood Pulleys.....dis 50@55

Rivets.

Iron, Thousand, list November 17, ...dis 50
Iron, Ordinary, Cooper's Block and Carriage list November 17.....dis 50
Copper.....dis 50@50&10

Rope.

Manilla, ¼ inch and over.....₩ lb 15¼
Sisal, ¼ inch and over.....₩ lb 13½

Sand Paper.

B. A. & Co.....dis 45@50
H. H. Barton's.....dis 40@45
New England Flint.....dis 40@50
Barton's Garnet.....dis 20

Saws.

Disston's Circular.....dis 40@10
" Band.....dis 20
" Scroll.....Net
Hack Saw Stubs.....dis 20
" " Eureka.....dis 20
" " Star.....dis 20
Saw Swages Disston's.....dis 30
Atkins' Circular Saws.....dis 40&45
" Mill, Mulay and Drag Saws..dis 40&10
" Wood Saws.....dis 40&10
" Silver Steel Diamond Cross-cut Saws.....dis 70c per ft
" Dexter Cross-cuts.....dis 50c "
" Diamond " .....dis 30c "
" Tuttle Tooth Cross-cuts..dis 25c "
" One-man Cross-cuts.....dis 33c "
No. 1 Handles.....dis 23c per pair
No. 6 " .....dis 16c "
Excelsior Saw Tools.....$6 per doz
Perfection " .....$15 "
Detroit Saw Works, Circular.....dis 50
" " " Band.....dis 25
" " " Mulay.....dis 45

Screws.

Wood Screws—New List 1890.

Flat head iron.....dis 72½
Round head iron.....dis 67½
Flat head brass.....dis 72½
Round head brass.....dis 65
Square Cap.....dis 65
Hexagon Cap.....dis 60
Set C. H. C. P.....dis 70
Machine, flat head, iron.....dis 65
Machine, round head, iron.....dis 60
Bench and hand—
Lag or coach.....dis 75@75&10
Coach, patent gimlet point.....dis 75

Shovels and Spades.

Ames' list November 1, 1885.....dis 20
Dennis.....dis 5.25
Hussey & Binns, railroad.....dis 8.00

Taps.

Cards, Hand and Nut to 2 in.....dis 50
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " " new list dis 10
Machine Screw Taps.....dis 55
Pipe Taps to 2½ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 50
Pulley Taps.....dis 40

Twine.

	BC.	B.
No. 12, Flax Twine, ¼ and ⅜ lb Balls		21c@29c
No. 18 " " ¼ and ⅜ "		18c@28c
No. 36 " " ¼ and ⅜ "		16c@27c
2-Ply Hemp, ¼ & ⅜ lb Balls (Spring Twine)		11¼c
3-Ply " 1 lb Balls		12@12¼c
3-Ply " 1¼ lb Balls		11@11¼c
Cotton Wrapping, 5 Balls to lb		15@16c

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25
Prentiss.....dis 20
Stephen's.....dis 25@30
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 15@20
Howard.....dis 35

Wire.

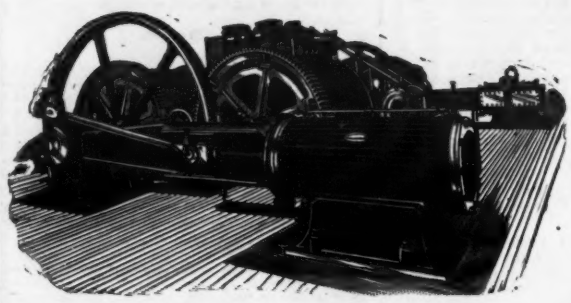
New List, Jan. 18, 1884

Brass and copper.....dis 20@25
Bright and annealed, Nos. 0@18...dis 70&10@75
" " Nos. 19@26..dis 75@75& 5
" " Nos. 27@36..dis 75&10& 5
Coppered Nos. 0 to 18, market list..dis 70@70& 5
Galvanized Nos. 0 to 18 " " .....dis 65&5
Tinned market Nos. 0 to 18.....dis 67½
Cast steel.....dis 50
Tinned Broom Wire.....dis 70&5@70&10
Annealed Fence, Nos. 8 and 9.....dis 75
Annealed Grape, Nos. 12 to 14.....dis 75
Stub's Steel Wire, regular.....$6.00@lb dis 5

Wrenches.

Coe's genuine, ...dis 50
Girard Standard.....dis 70&10
Agricultural.....dis 75&10
Mechanics'.....dis 55&10,& 5
Bemis & Call's Combination .....dis 35
Donohue's Engineers.....dis 20&10
Lamson & Sessions Engineers.....dis 60
Billings & Spencer's Drop Forged.....dis 25
William's " " .....dis 25
Alligator " " .....dis 50

Webster, Camp & Lane Machine Co.



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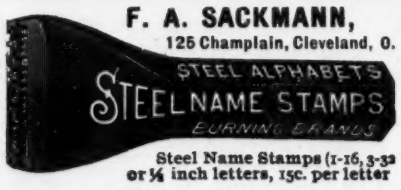

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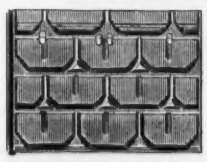

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Common augers and bits.....dis 70
Snell's.....dis 60&5
Cook's Douglass Mfg. Co.....dis 55
Russell Jennings' augers and bits.....dis 25
Expansive Bits, Clark's small, $18; large, $26.....dis 35@35&5
Hollow Augers, Ives'.....dis 25&10
Hollow Augers, Bonney's Adjust. ₩ doz., $48.....dis 40&10
Hollow Augers, Stearns' Adjust. ₩ doz., $48.....dis 20&10
Gimlet bits, common.....per gross $3 25@4 00
Standard Bit Stock Drills.....dis 50&10&5
Ship Augers.....dis 15&10@15&10&5

Axes.

Makers' and Special Brands—
First quality.....₩ doz $7 00
Others.....₩ doz $6 00
Full polished.....₩ doz $8 00

Bolts.

Cast iron barrel bolts.....dis 70
Cast iron shutter bolts, etc.....dis 70
Cast iron chain bolts.....dis 65&10
Ives' patent door bolt.....dis 60
Wrought iron barrel bolts.....dis 70
Wrought iron square bolts.....dis 70
Wrought shutter bolts.....dis 60&10
Sargent's list
Carriage, common, new list.....dis 75&10
Tire, common, new list.....dis 65
Carriage and tire, Philadelphia pattern.....dis 75&10
Stove bolts.....dis 60
Plow bolts.....dis 60&5
Machine.....dis 75&10@80
Ends.....dis 75&10&80

Buckets, Elevator.

.....dis 50&10

Butts.

Wrought brass.....dis 75&10
Cast brass, loose joint.....dis 33⅓
Cast Iron—
Fast joint, narrow.....dis 50&10&5@60
Fast joint, broad.....dis 50&10@60
Loose joint.....dis 70&10
Loose joint, jap.....dis 70&10
Loose joint, jap. with acorns.....dis 70&10
Loose pin, acorns.....dis 70&10
Loose pin, japanned acorns.....dis 70&10
Loose pin, acorns, jap. plated tips.....dis 70&10
Wrought steel—
Wrought, fast joint, narrow.....dis 70&10
Wrought, fast joint, broad.....dis 70&10
Wrought, loose joint, broad.....dis 70&10
Table Butts, back flaps, etc.....dis 70&10
Regular inside blind.....dis 70&10
Light inside blind.....dis 70&10
Loose pin.....dis 70&10
Light loose pin.....dis 70&10

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Asphaltum, Fine Grade, ₩ lb..... .08
Coal Tar Felt, 1 Ply, ₩ lb..... .02
Coal Tar Felt, 2 Ply, ₩ roll 108 sq ft..... 1.42½
Coal Tar Felt, 3 Ply, ₩ roll 108 sq ft..... 1.85
Roofing Pitch, ₩ gal..... .09

Chains.

Revised List.

Trace, 6½-10-2.....₩ pair 1.05
Trace, 6½-10-3.....₩ pair .92 } .....50&10
Trace, 7-10-2.....₩ pair 1.11
German Halter Chain, list June, 1887...dis 50&10
German Coil, list of June, 1887.....dis 50&10@60
Galvanized Pump Chain.....₩ lb 5½@6
Jack Chain, Iron.....dis 75&10
Jack Chain, Brass.....dis 75

Chisels.

Socket Framing and Firmer.....dis 75
Socket Framing and Firmer, Buck Bros..dis 30
Socket Firmer and Framing, L. & I. J. White.....dis 30@30&5
Tanged Firmers.....dis 40&10

Cutlery.

Table.....net
Excelsior Pocket.....net

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	Nos. 1	5.	5X.
Pails, water, 12 qt	$4 00	$4 50	$.....
Dairy, 14 qt	4 50	5 00	.....
Fire 12 qt	5 00	.....	.....
Sugar	6 00	6 50	.....
Horse	.....	5 00	.....
Buggy	4 00	.....	.....
Chamber, Slop, Commode } 5 and 5X 14 qt.	6 50	7 50	8 50
Tubs, slop, 5 and 5X 14 qt	8 00	9 00	10 00
Basins, wash—			
10½ inch	2 00	2 25	.....
12 inch	2 25	2 75	3 25
13½ inch	2 75	3 25	3 75
15 inch	3 25	3 75	4 25
Bowls, fruit	.....	2 50	.....
Servers, 12 in	.....	2 25	.....
Baskets, waste paper, 13 in	.....	6 00	.....
Spittons, "Daisy," pressed			
8 inch	4 00	4 50	5 00
10 and 11½ inch	6 00	6 50	7 50

No. 1 plain; No. 5 decorated; No. 5X White decorated.

Gimlets.

Nail and Spike.....dis 50&10&5
Double cut, low list.....dis 25
"Bee".....₩ gross $12, dis 25@25&5

Hanger

Barn door, old patterns.....dis 60&10&10@70
Climax, (Anti-Friction).....dis 55
Scranton.....dis 33—
Kidder's.....dis 50&10@60
Terry's Patent.....5 in., $12; 4 in., $10, dis 50&5
Paragon.....dis 40&10
Richard's.....dis 30@30&10

Horse Nails.

	No. 12	9	8	7	6	
Ausable, ₩ lb.	23	24	25	26	28	dis 40
Putnam, ₩ lb.	18	19	20	21	23	dis 15
Essex						dis 25&10

Horse Shoes.

Burden, at factory.....₩ keg $4 00
R. I. Horshoe Co., Perkins' Imp. at factory.....₩ keg $4 00
Mule Shoes, at factory.....₩ keg $5 00

Knobs.

Carriage, japanned.....₩ gross 80c dis 60&10
Base, rubber tip.....dis 70&10&5
Hemacite door knobs, new list.....dis 40&10@50
Door mineral.....dis 65c@68c
Door Por. japanned.....dis 75c@78c
Door Por. nickle.....$2 00@2 25
Door Por. plated.....$2 00@2 25

Locks, Bolts, Etc.

P. & F. Corbin, Locks and Bronze Goods.
Door locks, knobs and latches.....dis 60&10
Escutcheons and keys.....dis 60&10
Padlocks and padlock keys.....dis 75
Bell pulls, mineral, porcelain and jet dis 60&10
Bell pulls, genuine bronze.....dis 60&10
Lever bell pulls, genuine bronze.....dis 60&10
Butts', genuine bronze.....dis 60&10
Butts' bronze plated.....dis 60&10
Store door locks and latches.....dis 60&10
Store door handles.....dis 60&10
Shutter hinges & flaps, genuine bronze.dis 60&10
Shutter hinges, bronze plated.....dis 70
Flush bolts, genuine bronze.....dis 70
Shutter knobs, genuine bronze.....dis 50
Shutter bars, genuine bronze.....dis 60
Sash lifts, genuine bronze.....dis 60
Sash pulls and plates, genuine bronze.....dis 60
Push plates, genuine bronze.....dis 60
Drawer pull, genuine bronze.....dis 70
Letter box plates, genuine bronze....dis 60&10
Barn door locks.....dis 33⅓
Bishop's Buckeye Sash Locks.....₩ gross $4.80

Plumbs and Levels.

Standard list.....dis 70&10
Pocket levels.....dis 70&10
Davis' inclinometers.....dis 10&10

Pumps.

Cistern, best makers.....dis 50&10@60
Pitcher spout, best makers dis 60&10@60&10&10
Pitcher spout, cheaper goods.....dis 70@70&5

Pokes, Animal.

Bishop's I. X. L.....₩ doz $6 00
Bishop's O K.....₩ doz $5 25
Bishop's Pioneer.....₩ doz $3 75
Bishop's American.....₩ doz $2 75

Rakes.

Cast steel.....dis 70
Malleable.....dis 70@70&5

Razors.

J. R. Torrey Razor Co.....dis 20
Wostenholme & Butcher.....$10@$4...dis 10
Rifle razor.....dis $9 50 net

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Schuyler's.....₩ gross $15 00

Scales.

Hatch, Counter, No. 171.....₩ doz $21 00
Hatch, Tea, No. 161.....₩ doz $6 75@7 00
Chatillon's Grocers.....dis 50
Family Turnbulls.....dis 30@30&10
Scale Beams, List of January 12, 1888.....dis 50&10@50&10&4

Screw Drivers.

Stanley R. & L. Co.'s Varnished Handles.....dis 65&10
Stanley R. & L. Co.'s Black Handles..dis 60&10
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Squares.

Steel and iron, Nickel plated } dis 75&10@80
Disston's try square and T bevels.....dis 45&10
Winterbottom's try and miter.....dis 30&10

Tacks, Brads, Etc.

New List, Oct. 19, 1890.

American iron carpet tacks all kinds dis 77½&10
Steel carpet tacks all kinds.....dis 75&10
Swedes iron carpet tacks, all kinds dis 75&10
Swedes iron tacks.....dis 75&10
Swedes iron Upholsterers' tacks.....dis 75&10
Tinned Swedes iron tacks.....dis 77½&10
Tinned Swedes iron Upholsterers' tacks.....dis 77½&10
American iron cut tacks.....dis 77½&10
Copper tacks.....dis 40&10
Copper finishing and trunk nails.....dis 50&10
Cigar box nails.....dis 50&10
Finishing nails.....dis 60&10
Hungarian nails and miners' tacks...dis 60&10
Gimp and lace tacks.....dis 77½&10
" " " tinned.....dis 60&10
Trunk and clout nails.....dis 72½&10
Tinned trunk & clout nails.....dis 66&10
Basket nails.....dis 66&10
Chair nails.....dis 66&10
Common and patent brads.....dis 66&10

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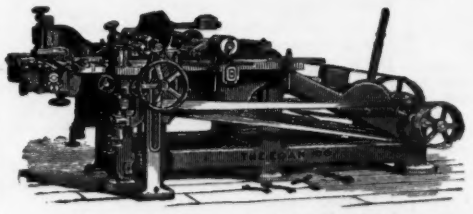

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Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn. 11
Steel Stamps and Stencils—
J. H. Fleharty & Co., Cleveland. 16
F. A. Sackman, Cleveland, O. 14
Jas. Murdock Jr., Cincinnati, O. 16
Sheet Iron—
Cleveland Rolling Mill Co., Cleveland. 13, 16
Cambridge Iron & Steel Co., Cambridge, O 13
Steel Castings—
Chester Steel Casting Co., Philadelphia, Pa. 19
Steel Rails, Blooms and Billets—
Cleveland Rolling Mill Co., Cleveland. 13, 16
Sheet Steel—
Cambridge Iron & Steel Co., Cambridge, O 13
Stokers—
Brightman Stoker Co., Cleveland. 15
Steam and Hot Water Heaters—
Hazelton Tripod Boiler Co., Chicago. 18
Steel Laths—
Bostwick Steel Lath Co., Niles, O. 11
Twist Drills—
Cleveland Twist Drill Co., Cleveland. 20
Graham Twist Drill Co., Detroit, Mich. 20
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Cleveland City Forge & Iron Co., Cleveland. 20
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The Automatic Time Stamp and Register Co, Boston, Mass. 14
Water Gas Furnaces—
W. S. Hutchinson, Chicago, Ill. 20
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Hartman Sliding Blind Co., Wooster, O. 16
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*Indiana Machine Work, Ft. Wayne, Ind —
Geo. Place, New York, N. Y. 12
Frank & Co., Buffalo, N. Y. 18
The Egan Co., Cincinnati, O. 15
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*F. Powell & Co., Toledo, O. —
Wire Machinery—
John Adt & Son, New Haven, Conn. 16
Well Sinking Machinery—
American Well Works, Aurora, Ill. 20
Washers—
Milton Mfg. Co., Milton, Pa. 11

LOOK AT THIS YOU WILL BE SURPRISED AT The Facts About MUSKEGON

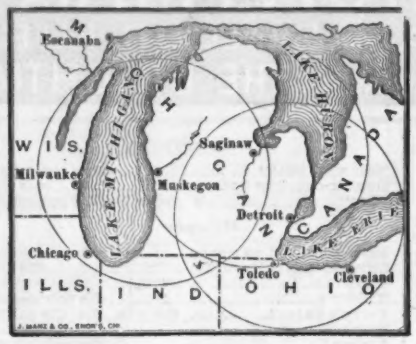
These Three Circles **3 Circles** Have each a radius of 125 miles.

Each has, in round numbers population viz:

SAGINAW CIRCLE - - 1,725,000
DETROIT CIRCLE - - 2,600,000
MUSKEGON CIRCLE - 2,725,000

For proof, see Cram's Atlas, Census 1890, by counties.

OBJECT LESSON.



FROM THIS YOU WILL UNDERSTAND **WHY MUSKEGON** IS ABLE TO GET SO MANY NEW FACTORIES—21 IN LAST 18 MONTHS AND MORE COMING. IT MAY ALSO GIVE YOU A *Pointer* ABOUT INVESTMENTS.

There will be one large city on the east shore of Lake Michigan, AND THAT PLACE WILL BE **MUSKEGON.**

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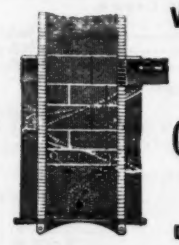

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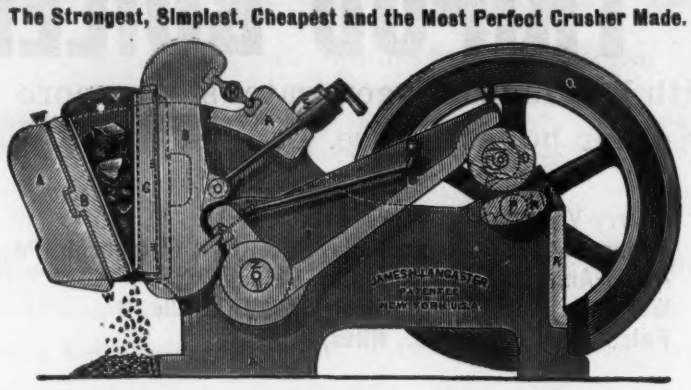

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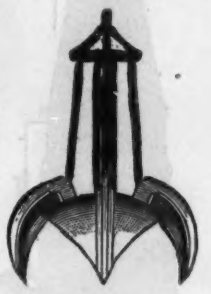

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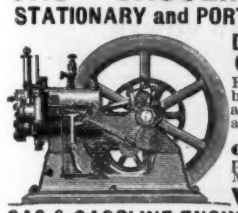

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HARNESS MENDERS

WANTS ANOTHER, SO DO YOU.

They do the work Quickly, are Strong and Cheap, if you break your Harness when at work in the field you can mend it in half a minute and

IT ONLY COSTS HALF A CENT,

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Through Sleepers Between
PITTSBURGH AND CHICAGO.
AND DAY COACHES BETWEEN
Toledo and Pittsburgh, Via Akron, Cuyhoga Falls, Kent, Ravenna, Leavittsburg, Warren, Niles, Girard, Youngstown, New Castle and Allegheny.

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	Arrive.	Depart.
N. Y. & Pitts. Express.....	‡5 38 a m	*8 25 a m
Fast N. Y. & Pitts. Express	*10 55 a m	*3 00 p m
Mahoning Accommo.....		†6 40 a m
Pittsburgh Express.....	†6 25 p m	
Youngstown Local.....	†8 05 a m	
Mahon'g div. & Pitts Local		*11 40 a m
Mahoning Val. Accom.....		†4 30 p m
Pittsburgh Express.....	‡1 20 p m	11 10 p m
New York Express.....	*8 00 p m	.....

*Daily. †Daily, except Sunday. ‡Daily except Monday.

Cleveland & Canton Railroad.

(Standard Gauge.)

Depart for—

Zanesville and Coshocton—6:50 a. m., 3:00 p. m.
Canton—6:50 a. m., 3:00 p. m., 6:20 p. m.
Kent—6:50 a. m., 3:00 p. m., *5:45 p. m. 6:20 p. m.
Bedford—6:50 a. m., 11:10 a. m., 1:30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m. 10:35 p. m.
Newburgh—6:15 a. m., 6:50 a. m., 11:10 a. m., 1.30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m., 10:35 p. m.

Arrive from—

Zanesville and Coshocton—10:30 a. m.,6:30 p. m.
Canton, 10:30 a. m., 2:35 p. m., 6:30 p. m.
Kent—*8:10 a. m., 10:30 a. m., 2:35 p. m., 6:30 p.m.
Bedford—6:00 a. m., *8:10 a.m., 10:30 a.m., 1:05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p.m., 7:10 p.m.
Newburgh—6:00 a. m., 7:15 a. m., *8:10 a. m., 10:30 a. m., 1.05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p. m., 7:10 p. m.

Trains marked * run daily.

Valley Railway.

FOR AKRON, CANTON AND MARIETTA.

Depot oot South Water Street.

	Depart.	Arrive.
Valley Junction Mail.....	*7 25 a m	*6 40 p m
Marietta Express.....	†11 15 a m	†2 35 p m
Balto. & Wash. Express....	*4 00 p m	*10 25 a m
Cleve. and Canton Express	†6 30 p m	†8 15 a m

*Daily. †Daily, except Sunday.

J. T. JOHNSON, Gen. Supt. J. B. CAVEN, Gen. Pass. Agt.

From Cleveland Union Station.

PENNSYLVANIA LINES.

Cleveland & Pittsburgh R. R.

	Arrive.	Depart.
For Pittsburgh, Baltimore, Washington, Philadelphia and New York.	d5 25 a m d11 40 a m 6 35 p m	7 45 a m d1 40 p m d11 10 p m
Wellsville, Wheeling and Bellaire.	12 30 p m 6 35 p m	7 45 a m 1 05 p m *11 10 p m
Alliance Accom.....	10 10 a m	3 25 p m
Ravenna Accom.....	8 25 a m	5 00 p m

d Daily. *Except Saturday. Other trains except Sunday. Through Pullman Sleepers to New York on 1:40 p. m. train daily.

From Cleveland Union Station.

Mt Vernon and Pan Handle Route

Cleveland & Pittsburgh R. R.

	Arrive.	Depart.
For Cuyahoga Falls, Akron, Orrville, Millersburg, Gambier, Mt. Vernon, Columbus, Xenia, Dayton, Cincinnati, Louisville, Indianapolis, St. Louis, and all points in the South and Southwest	d 7 00 am 5 40 p m	8 00 a m d 8 00 p m
For Cuyahoga Falls, Akron, Orrville, Millersburg, Gambier, Mt. Vernon and Columbus.	12 30 p m	1 05 p m
For Cuyahoga Falls, Akron, Orrville, Chicago, and all points in the West and Northwest.	5 40 p m 10 10 a m	8 00 a m 3 25 p m

d Daily. Other trains except Sunday.

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PICTURESQUE ROUTE
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No. 62, Accommodation.....	† 6 00 a m
No. 72, New York & Pitts. Express....	* 8 10 a m
No. 70, Pittsburgh Accom.....	*11 25 a m
No. 64, New York & Pitts. Limited...	* 2 50 p m
No. 66, Mantua Accommo.....	* 4 20 p m
No. 74, Youngst'n Ex.....	† 6 00 p m
No. 68, New York & Pitts. Ex.....	*11 00 p m
	Arrive.
No. 61, N. Y. & Pittsburgh Express...	† 5 15 a m
No. 71, Youngstown Accom.....	* 7 15 a m
No. 65, New York & Pitts. Lim.....	* 9 55 a m
No. 67, Pittsburgh Accom.....	*12 30 p m
No. 73, Leavittsburgh Local.....	* 2 10 p m
No. 63, New York & Pitts. Ex.....	* 6 50 p m
No, 75, Mantua Accom.....	* 7 20 p m
No. 69, Youngstown Express.....	† 9 10 p m

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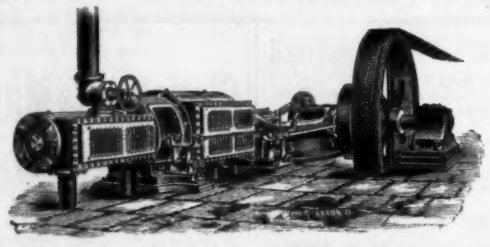

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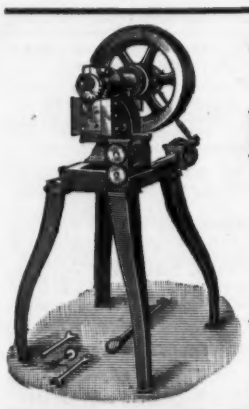

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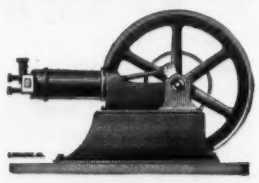

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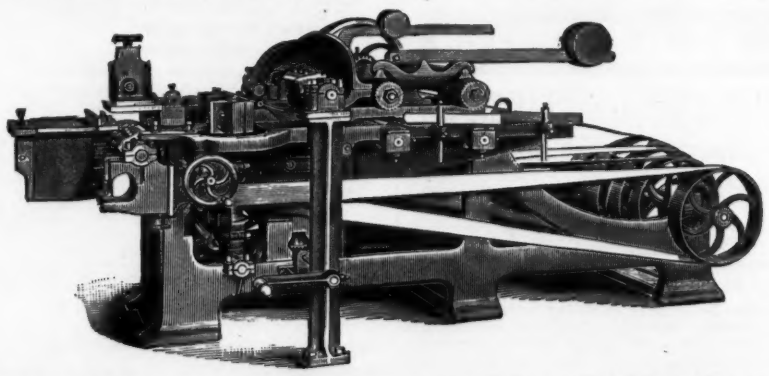

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Central Railway of New Jersey	4	275
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Chicago, Burlington & Quincy Railroad Co	3	175
Chicago, Milwaukee & St. Paul Railroad Co	5	100
Chicago, Rock Island & Pacific Railroad Co	4	170
Colorado Midland Railway Co	1	25
Denver & Rio Grande Western Railroad Co	3	75
East Tennessee, Virginia & Georgia Railroad Co	3	325
George's Creek & Cumberland Railroad Co	2	50
Grand Trunk Railway Co. of Canada	12	500
Gulf, Colorado & Santa Fe Railway Co	3	135
Kansas City, Wyandotte & Northwestern Railway Co	2	55
Newport News & Mississippi Valley Co	2	200
New York Central & Hudson River Railroad Co	4	125
New York, Lake Erie & Western Railroad Co	2	140
New York, West Shore & Buffalo Railroad Co	6	340
Northern Pacific Railroad Co	2	45
Pennsylvania & Northwestern Railroad Co	1	25
Pennsylvania Railroad Co	51	2330
Peoria & Pekin Union Railroad Co	1	55
Philadelphia & Reading Railroad Co	7	615
Pittsburgh, Cincinnati, Chicago & St. Louis Railway Co	2	20
St. Louis & San Francisco Railway Co	3	260
Southern Railway Co	1	10
Wabash, St. Louis & Pacific Railroad Co	4	60
Washington & Georgetown Railway Co	1	15

Many foreign railroads unreported.

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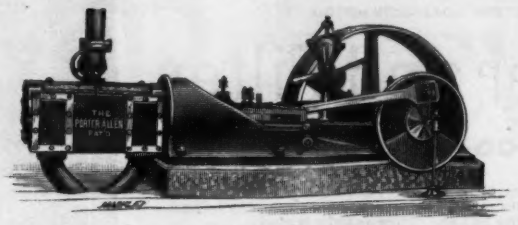

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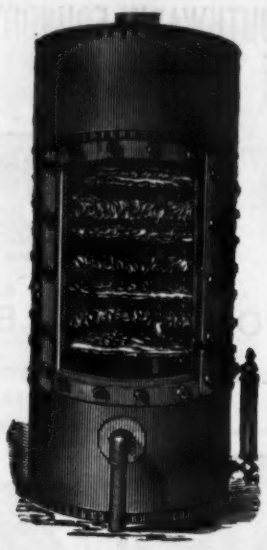

This cut is the fac simile of the appearance of the shelves o. a No. 5 Heater at work on ordinary lime-water when the door was removed after the Heater had been running two weeks.

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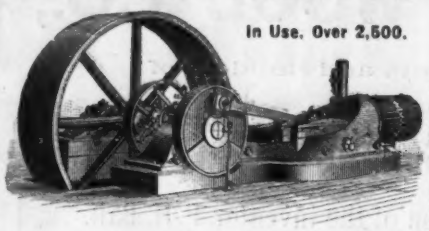

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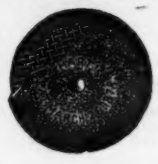

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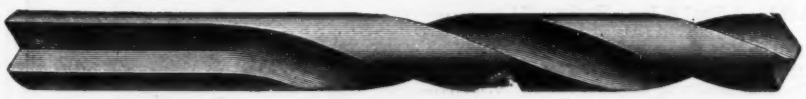

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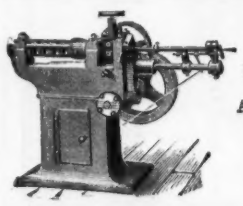

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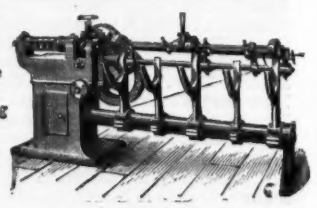

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